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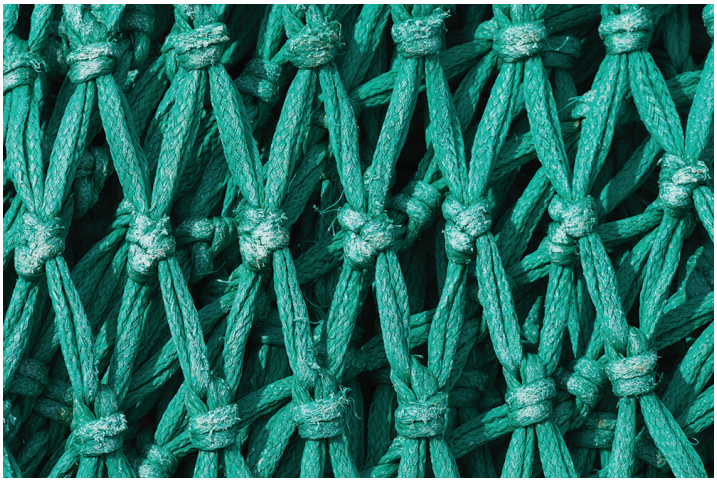
Accumulation of Disadvantage from Adolescence to Midlife. A 26-Year Follow-Up Study of 16-Year Old Adolescents



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Accumulation of disadvantage from adolescence to midlife

A 26-year follow-up study of 16-year old adolescents

Noora Berg

ACADEMIC DISSERTATION
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Abstract

There is a wide range of evidence that childhood conditions are associated with adult wellbeing and disadvantage. However, in many cases, there is still a lack of knowledge on how and why these associations are formed. The life-course perspective examines these longitudinal mechanisms linking wellbeing and disadvantage in different life phases and tries to understand the continuities and discontinuities of individual lives. Information on these longitudinal associations is needed in order to be able to affect adverse life paths.

For several decades, it has been suggested that disadvantage is a multidimensional concept that encompasses several dimensions of life such as health, social relations, socioeconomic factors and risky behaviour. Different forms of disadvantage are known to correlate, but less is known about how these disadvantages are interlocked in time. Accumulation of disadvantage refers to these processes, where previous disadvantages affect subsequent disadvantage. Mortality can be seen as an extreme end point of accumulation of disadvantage.

The multidimensional approach to disadvantage is still underutilized in research in many ways. Often the focus has been in socioeconomic and health related forms of disadvantage or in risky behaviour, but rarely studies have taken several different dimensions of life into account simultaneously.

The general aim of this study was to examine accumulation of disadvantage from adolescence to midlife in a life-course perspective. This study approaches the concept of disadvantage from a multidimensional perspective covering life dimensions of health, social relations, socioeconomic factors and risky behaviour.

This study is a part of wider follow-up study Stress, Development and Mental Health – Study (TAM-project), which is carried out at the National Institute for Health and Welfare (THL). The study has prospectively followed up a Finnish urban age cohort at the ages of 16, 22, 32 and 42. The original study population included all Finnish speaking ninth-grade pupils attending secondary schools in the spring of 1983 in Tampere, Finland. In the first phase of the study, 2194 pupils (96.7%) aged 16 years completed a self-administered questionnaire during school hours. In three later phases the study cohort was followed up using postal questionnaires when the subjects were 22 (n=1656, 75.5%), 32 (n=1471, 67.0%) and 42 (n=1334, 60.7%) years old.

This study examined multidimensional disadvantage using life-course models of clustered disadvantage, chain of risk and accumulation and found support for all of them. According to the results of this study, several individual and clustered forms of disadvantage in adolescence were associated with mortality before midlife. Lack of educational plans or uncertainty of them at age 16 was the strongest single predictor of mortality. Multiple simultaneous forms of disadvantage related to social relations, risky behaviour and own and parental socioeconomic factors were associated with mortality. This was the case also when disadvantage extended to many dimensions of disadvantage simultaneously.

We found that poor family relationships in adolescence played a role in chains of disadvantages lasting all the way to midlife. The pathways from poor family relationships to economic adversity in midlife were shaped by low education and poor mental health in

early adulthood in women. In men this association was found to be shaped by early adult education, but it was explained by poor school performance already at age 16, indicating that those men with poor family relationships are already in adolescence on a disadvantage trajectory that will continue into adulthood regardless of whether they have problems in family relationships. The pathways to poor mental health in midlife were shaped mainly by mental health in early adulthood and in women also by heavy drinking.

In the final life-course model we focused on accumulation of heavy drinking and examined it by using trajectory models. The results indicate that women of the steady high alcohol trajectory from adolescence to midlife had an increased risk of experiencing almost all measured disadvantages at age 42 (health, social relations, socioeconomic factors). In men, those who increased their drinking or drank steadily heavily had an increased risk for experiencing health and economic disadvantage in midlife. Frequent heavy drinking in adolescence did not leave 'a scar' that would associate with midlife disadvantage, if the drinking was reduced after adolescence.

Childhood and adolescent disadvantages have long-term effects on wellbeing/disadvantage all the way to midlife, but they do not inexorably determine people's lives, also conditions in other life phases shape the life course. This provides many possibilities for preventive actions that should be targeted, not only to early years of life, but to later life phases as well. Our results highlight the importance of targeting interventions to improving the family relationships, supporting the educational career of the disadvantaged and preventing detrimental alcohol use.

Keywords: adolescence, alcohol use, disadvantage, early adulthood, education, family relationships, health, health behaviour, heavy drinking, life course, mental health, midlife, risky behaviour, socioeconomic position, social relationships, wellbeing

Tiivistelmä

On olemassa paljon tutkimustietoa siitä, kuinka lapsuuden olosuhteet ovat yhteydessä aikuisuuden hyvinvointiin ja huono-osaisuuteen. Siitä huolimatta, puuttuu tietoa siitä, miten ja miksi nämä yhteydet muodostuvat. Elämänkulun näkökulma tutkii näitä pitkittäisiä mekanismeja, joiden kautta huono-osaisuus ja hyvinvointi yhdistyvät eri elämänvaiheissa sekä pyrkii ymmärtämään jatkuvuuksia ja katkoksia yksilöiden elämänkulussa. Tietoa näistä pitkittäisistä yhteyksistä tarvitaan, jotta voidaan vaikuttaa epäsuotuisiin elämän polkuihin.

Jo vuosikymmeniä on ajateltu, että huono-osaisuus on moniulotteinen käsite, joka kattaa useita elämän ulottuvuuksia kuten terveys, sosiaaliset suhteet, sosioekonomiset tekijät ja riskikäyttäytyminen. Tiedetään, että huono-osaisuuden eri ulottuvuudet korreloivat keskenään, mutta vähemmän tiedetään siitä, kuinka ne liittyvät yhteen ajan kuluessa. Huono-osaisuuden kasautuminen viittaa näihin prosesseihin, joissa aikaisempi huono-osaisuus vaikuttaa myöhempään huono-osaisuuteen. Kuolema voidaan nähdä eräänlaisena äärimmäisenä huono-osaisuuden kasautumisen päätepisteenä.

Moniulotteisen huono-osaisuuden näkökulma on edelleen monin tavoin alikäytetty tutkimuksessa. Usein on kiinnitetty huomiota sosioekonomisiin tai terveyteen liittyviin huono-osaisuuden muotoihin tai riskikäyttäytymiseen, mutta harvoin tutkimuksissa on otettu useita erilaisia ulottuvuuksia huomioon samanaikaisesti.

Tämän tutkimuksen päätavoitteena oli tutkia huono-osaisuuden kasautumista nuoruudesta keski-ikään elämänkulku näkökulmasta. Tämä tutkimus lähestyy huono-osaisuuden käsitettä moniulotteisesta näkökulmasta kattaen terveyden, sosiaalisten suhteiden, sosioekonomisten tekijöiden ja riskikäyttäytymisen ulottuvuudet.

Tämä tutkimus on osa Stressi, kehitys ja mielenterveys –tutkimusta (TAM-hanke), joka toteutetaan Terveyden ja hyvinvoinnin laitoksella (THL). Tutkimuksessa on seurattu prospektiivisesti yhden suomalaisen kaupungin ikäkohorttia 16-, 22-, 32- ja 42-vuoden iässä. Tutkimuksen kohderyhmään kuuluivat kaikki suomenkieliset keväällä 1983 Tampereella peruskoulun yhdeksättä luokkaa käyneet oppilaat. Ensimmäisessä vaiheessa 2194 16-vuotiasta oppilasta (96,7 %) vastasi kyselyyn oppitunneilla. Kolmessa myöhemmässä vaiheessa kohorttia seurattiin postikyselyin 22 (n=1656, 75,5 %), 32 (n=1471, 67,0 %) ja 42 (n=1334, 60,7 %) vuoden iässä.

Tässä tutkimuksessa moniulotteista huono-osaisuutta tutkittiin käyttäen elämänkulkunäkökulman malleja huono-osaisuuden ryhmittymisestä, riskien ketjuista ja kasautumisesta ja löydettiin viitteitä niistä kaikista. Tämän tutkimuksen mukaan sekä yksittäiset että ryhmittyneet nuoruusiän huono-osaisuustekijät olivat yhteydessä kuolleisuuteen ennen keski-ikää. Koulutussuunnitelmien puuttuminen tai epävarmuus niistä 16-vuotiaana oli voimakkain yksittäinen riskitekijä kuolleisuudelle. Sosiaalisiin suhteisiin, riskikäyttäytymiseen ja omaan tai vanhempien sosioekonomiseen asemaan liittyvät useat samanaikaiset tekijät olivat yhteydessä kuolleisuuteen. Näin oli myös silloin, kun huono-osaisuus ulottui useille ulottuvuuksille samanaikaisesti.

Havaitsimme, että vaikeat nuoruusiän perhesuhteet olivat merkityksellisiä huono-osaisuuden kehityskuluissa aina keski-ikään asti. Polut nuoruusiän vaikeista perhesuhteista keski-iän taloudellisiin vaikeuksiin muotoutuivat varhaisaikuisuuden matalan koulutuksen

ja mielenterveysongelmien kautta naisilla. Miehillä tämä yhteys muovautui varhaisaikuisuuden koulutuksen kautta, mutta se selittyi koulumenestyksellä jo 16-vuotiaana. Tämä viittaa siihen, että miehet, joilla oli vaikeuksia perhesuhteissa nuoruusiässä, olivat jo nuoruudessaan heikkoihin tulevaisuuden näkymiin johtavalla polulla, joka jatkui aikuisuuteen, riippumatta vaikeuksista perhesuhteissa. Polut keski-iän mielenterveysongelmiin muovautuivat pääasiassa varhaisaikuisuuden mielenterveyden kautta sekä naisilla myös humalajuomisen kautta.

Viimeisessä elämänkulkumallissa keskityttiin humalajuomisen kasautumiseen ja sitä tutkittiin käyttäen kehityspolkuanalyysia. Tulosten mukaan naiset, jotka joivat tasaisesti usein humalaan nuoruudesta keski-ikään, kokivat todennäköisemmin lähes kaikkia mitattuja huono-osaisuuksia 42-vuotiaana (terveys, sosiaaliset suhteet, sosioekonomiset tekijät). Miehet, jotka lisäsivät usein tapahtuvaa humalajuomista tai jotka joivat usein humalaan kaikissa ikävaiheissa, kokivat keski-iässä todennäköisemmin terveyteen ja talouteen liittyvää huono-osaisuutta. Nuoruusiän usein toistuva humalajuominen ei jättänyt pysyvää keski-iän huono-osaisuuteen johtavaa ”arpea”, jos juominen väheni nuoruusiän jälkeen.

Lapsuudessa ja nuoruudessa koetulla huono-osaisuudella on pitkäaikainen vaikutus hyvinvointiin/huono-osaisuuteen aina keski-ikään saakka, mutta se ei vääjäämättä määritä ihmisen elämää, myös olosuhteilla muissa elämänvaiheissa on merkitystä. Tämä luo monia mahdollisuuksia huono-osaisuuden ehkäisytyölle, jota tulisi kohdentaa, ei ainoastaan varhaisimpiin ikävuosiin, vaan myös myöhempiin ikävaiheisiin. Tuloksemme korostavat huomion suuntaamista perhesuhteiden parantamiseen, koulutuspolkujen tukemiseen etenkin henkilöillä, jotka kokevat huono-osaisuutta, sekä haitallisen alkoholin käytön ehkäisyyn.

Avainsanat: alkoholikäyttö, elämänkulku, humalajuominen, huono-osaisuus, hyvinvointi, keski-ikä, koulutus, mielenterveys, nuoruus, perhesuhteet, riskikäyttäytyminen, sosiaaliset suhteet, sosioekonominen asema, terveys, varhaisaikuisuus

Sammandrag

Det finns mycket forskningsdata om hur förhållandena under barndomen hänger samman med välfärd och missgynnsamhet som vuxen. Trots detta saknas det uppgifter om hur och varför sådana samband uppkommer. Livsloppsaspekten undersöker dessa längsgående mekanismer, genom vilka missgynnsamhet och välfärd korsar varandra i olika levnadsskeden samt strävar efter att förstå vilka faktorer som orsakar varaktiga samband eller avbryter dessa under livsloppet. Det behövs information om de längsgående sambanden för att man ska kunna inverka på missgynnsamma livsbanor.

Missgynnsamhet har redan i decennier betraktats som ett mångfasetterat begrepp som täcker flera livsdimensioner, såsom hälsa, sociala relationer, socioekonomiska faktorer och riskbeteende. Det är känt att olika dimensioner av missgynnsamhet korrelerar med varandra, men man vet mindre om vilka samband de har över tiden. Det faktum att missgynnsamhet hopar sig antyder att det finns sådana processer där tidigare missgynnsamhet inverkar på senare missgynnsamt utfall. Döden kan ses som en slags extrem ändpunkt då missgynnsamhet hopar sig.

Missgynnsamhet som ett flerdimensionellt begrepp är fortfarande på många sätt underanvänt i forskningen. Ofta har man fäst uppmärksamhet vid socioekonomisk eller hälsorelaterad missgynnsamhet eller riskbeteende, men sällan har undersökningar samtidigt beaktat flera olika dimensioner.

Huvudsyftet med den här undersökningen var att undersöka missgynnsamhet med tanke på hela levnadsförloppet då missgynnsamhet hopar sig från ungdomen till medelåldern. Undersökningen betraktar missgynnsamheten ur ett flerdimensionellt perspektiv som omfattar hälsa, sociala relationer, socioekonomiska faktorer och riskbeteende.

Undersökningen är en del av undersökningen Stress, utveckling och psykisk hälsa (TAM-projektet) som genomförs vid Institutet för hälsa och välfärd (THL). I undersökningen har man prospektivt följt upp en ålderskohort i en finländsk stad i 16, 22, 32 och 42 års ålder. Undersökningens målgrupp omfattade alla finskspråkiga elever i grundskolans årskurs 9 i Tammerfors på våren 1983. I det första skedet svarade 2 194 elever (96,7 %), som då var 16 år, på en enkät under lektionstid. I det senare tredje skedet följde man upp kohorten med en enkät som skickades per post i 22 (n=1656, 75,5 %), 32 (n=1471, 67,0 %) och 42 (n=1334, 60,7 %) års ålder.

I undersökningen undersöktes flerdimensionell missgynnsamhet genom att använda modeller som bygger på livssloppsteorin om grupperingen av missgynnsamhet, riskkedjor och hopning av missgynnsamt utfall och det fanns tecken på alla dessa. Enligt undersökningen hade både individuella och gruppbaserade missgynnsamhetsfaktorer i ungdomsåren ett samband med dödligheten före medelåldern. Avsaknaden av eller osäkra utbildningsplaner som 16-åring var den kraftigaste enskilda riskfaktorn för dödlighet. Flera samtidiga faktorer som ansluter sig till sociala relationer, riskbeteende och den egna eller föräldrarnas socioekonomiska ställning hade ett samband med dödligheten. Situationen var densamma då missgynnsamheten omfattade flera dimensioner samtidigt.

Vi observerade att svåra familjeförhållanden i ungdomsåldern är av betydelse för hur missgynnsamhet utvecklas ända upp till medelåldern. Hos kvinnor orsakade svåra

familjeförhållanden i ungdomen ekonomiska svårigheter i medelåldern, vilket förmedlades via låg utbildningsnivå och psykiska problem i tidig vuxenålder. Hos män utvecklades detta samband via utbildningsnivån i tidig vuxen ålder, men sambandet kunde förklaras med skolframgången redan vid 16 års ålder. Detta tyder på att de män som hade svåra familjeförhållanden i ungdomsåldern redan i sin ungdom var inne på en väg med svaga framtidsutsikter, vilket fortsatte upp i vuxen ålder oberoende av familjeförhållandena. Psykiska problem i medelåldern förmedlades i huvudsak via psykisk hälsa i tidig vuxenålder samt hos kvinnor även via berusningsdrickande.

Den sista livsloppsmodellen fokuserades på upprepat berusningsdrickande, vilket undersöktes med trajektorieanalys. Resultatet visade att de kvinnor som jämnt och ofta drack sig berusade i ungdomsåldern fram till medelåldern mer sannolikt upplevde nästan alla dimensioner av missgynnsamhet som 42-åringar (hälsa, sociala förhållande, socioekonomiska faktorer). Män som ökade sitt berusningsdrickande eller som drack sig berusade i alla åldersskeden var sannolikare missgynnade då det gäller hälsa och ekonomi i medelåldern. Personer som ofta drack sig berusade i ungdomsåldern fick inga bestående "ärr" som ledde till missgynnsamhet i medelåldern, förutsatt att drickandet minskade efter ungdomsåren.

Missgynnsamhet i barndomen och ungdomen har en långvarig inverkan på välfärd och missgynnsamhet ända upp i medelåldern, men bestämmer inte ofrånkomligt människans liv, utan även förhållandena under andra livsskeden är av betydelse. Detta skapar många möjligheter att förebygga missgynnsamhet, vilka inte enbart bör riktas till de tidiga levnadsåren, utan även till senare livsskeden. Våra resultat framhäver att uppmärksamhet bör riktas på att förbättra familjeförhållanden, stöda utbildningsvägar särskilt för personer som upplever sig vara missgynnade, samt på att förebygga skadligt alkoholmissbruk.

Nyckelord: alkoholbruk, berusningsdrickande, familjeförhållanden, hälsa, livslopp, medelålder, missgynnsamhet, psykiska hälsa, riskbeteende, sociala relationer, socioekonomiska ställning, ungdom, utbildning, välfärd

Contents

List of original publications

This thesis is based on the following publications:

I Berg N, Huurre T, Kiviruusu O, Aro H. Nuoruusiän huono-osaisuus ja sen kasautumisen yhteys kuolleisuuteen. Seurantatutkimus 16-vuotiaista nuorista. (The relationship between disadvantage in adolescence, its accumulation and mortality. A follow-up study of 16-year old adolescents.) (In Finnish with English summary) Sosiaalilääketieteellinen Aikakauslehti. 2011 48 (3), 168-181.

II Berg N, Kiviruusu O, Karvonen S, Rahkonen O, Huurre T. Pathways from poor family relationships in adolescence to economic adversity in mid-adulthood. Advances in Life course Research. 2016 doi:10.1016/j.alcr.2016.07.001 *In press.*

III Berg N, Kiviruusu O, Karvonen S, Rahkonen O, Huurre T. Pathways from problems in adolescent family relationships to midlife mental health via early adulthood disadvantages – a 26-year longitudinal study. *Submitted.*

IV Berg N, Kiviruusu O, Karvonen S, Kestilä L, Lintonen T, Rahkonen O, Huurre T. A 26-year follow-up study of heavy drinking trajectories from adolescence to mid-adulthood and adult disadvantage. Alcohol and Alcoholism. 2013 48 (4): 452–457

The publications are referred to in the text by their roman numerals.

Abbreviations

AUDIT	Alcohol Use Disorders Identification Test
BIC	Bayesian information criterion
BLRT	Bootstrapped parametric likelihood ratio test
CFI	Comparative fit index
χ^2	Chi-square test for significance of difference
CI	Confidence interval
FIML	Full information maximum likelihood
HR	Hazard ratio
ICD	International Classification of Diseases
K10	Kessler Psychological Distress Scale
LCGA	Latent class growth analysis
N/n	Number
OR	Odds ratio
R-BDI	Raitasalo's modification of the short form of the Beck Depression Inventory
RMSEA	Root-mean-square error of approximation
S-BDI	Short version of Beck Depression Inventory
SD	Standard deviation
SEM	Structural equation model
SEP	Socioeconomic position
TAM	Tamperelaisnuorten mielenterveys –seurantatutkimus [Stress, Development and Mental Health Study], Finland
THL	National Institute for Health and Welfare
TLI	Tucker-Lewis index
WLSMV	Weighted Least Square parameter estimates using a diagonal weight matrix with standard errors and Mean- and Variance-adjusted chi-square test statistic that use a full weight matrix

1 Introduction

Wellbeing is a multidimensional concept that (at the individual level) refers to a situation where a person's needs are satisfied and he/she has resources to fulfil themselves and live a satisfying life. The criterion for a satisfying life varies depending on the definer and is shaped by values. The concept has been defined to cover various different dimensions of life, most often living conditions, health, social relationships, and forms of self-actualization (e.g. Allardt and Uusitalo 1972).

Wellbeing has increased substantially during the past decades in Finland, but it is not equally distributed in society (Talala et al. 2014; Tarkiainen et al. 2012). As the reduction of inequality in wellbeing is considered to be an important political and also moral aim (Therborn 2013), it is important to gain knowledge on the various factors at different individual and societal levels affecting the distribution of wellbeing and disadvantage.

Disadvantage can be viewed as a lack of resources to live a satisfying life. Studies from the 1960s to the 1980s on living conditions and welfare (e.g. Allardt and Uusitalo 1972) preceded empirical research on disadvantage in Finland (Niemelä and Saari 2013). Disadvantage became a popular topic in research as well as in politics in the 1980s and continued to be of interest during the nationwide economic recession of the 1990s in Finland (Helne 1994; Helne 2002). Its roots were in poverty research carried out in the United Kingdom, the United States, Sweden, and Denmark (e.g. Johansson 1970; Rauhala 1988; Townsend 1979). The discourse of disadvantage has been linked to the challenges faced by the welfare state and social policy. In the 1990s disadvantage research was said to be fashionable (Helne 1994) and it seems that in the 2010s it still has not gone out of style (Myrskylä 2012; Palola, Hannikainen-Ingman, and Karjalainen 2012; Suurpää 2009). In recent years, political concern has focused especially on adolescents and young adults at risk of social exclusion (Aaltonen, Berg, and Ikäheimo 2015; Määttä and Määttä 2015; Notkola et al. 2013; Ristolainen, Varjonen, and Vuori 2013).

The public discussion about disadvantage has mainly focused on the costs of disadvantage and the proportion of people not in education (adolescents), outside the workforce, and living on welfare benefits. However, already decades ago it was clear that poverty and disadvantage were too complex phenomena to be viewed purely as a lack of material resources or low income (Jonsson 1969; Rutter and Madge 1976). This multidimensional and holistic approach to disadvantage has been widely accepted and it has been studied from various viewpoints. Disadvantage can cut across all dimensions of life, such as health, social relations, education, and employment. Despite acknowledging this multidimensional perspective to disadvantage, there is a lack of multidimensional perspective in empirical research.

Individual disadvantages are common and can be transient. For example, it has been suggested that the lifetime prevalence for having had any mental health problems is between one third and half of the population (Kessler and Wang 2008; Steel et al. 2014). In addition, it has been estimated that there are over 50 000 adolescents or young adults who are not in education, employment, or training and do not have any education after compulsory school in Finland. However, 60% of them have continued their schooling or gone into work within the next five years (Myrskylä 2012). The most disadvantaged are

usually those who experience several disadvantages simultaneously, which continue from one life phase to another. Thus, the aim to reduce inequality should be targeted at preventing different disadvantages from clustering and accumulating. This requires better understanding of the ways that patterns of disadvantage form and persist.

Accumulation of disadvantage is a temporal process and the life-course perspective has become a more common approach to wellbeing and disadvantage in research and to some extent also in politics (Suurpää 2009). Disadvantage manifests differently in childhood, adolescence, early adulthood, midlife, and old age. In addition to specific features in these different life phases, it is also important to examine the role and timing of life events and transitions (Elder and Giele 2009). However, it might be that the transitions that have an important role in the accumulation of disadvantage do not follow the traditional and formal transitions (e.g. beginning school) (Suurpää 2009). It has been stated that society and the living environment have become much more complex and pluralistic than previously. People age in a world with rapid changes and multiple possible choices (Buchmann 1989; Chisholm and Hurrelmann 1995). For example, the transition to adulthood has become protracted (Settersten and Ray 2010). In the life-course perspective, it is important to take into account the historical context in which a certain study cohort has lived.

We know much about how disadvantages correlate and it is also well documented that childhood conditions are associated with adult wellbeing. Despite the growing number of longitudinal studies, there are still many gaps in the knowledge of how these disadvantages are temporally associated, i.e. how these processes in the life course produce disadvantage (see Kainulainen 2006) and what are the mechanisms linking childhood and adult conditions. Information on these pathways is needed in order to know when and where to target interventions.

In addition to the lack of long follow-up studies examining mechanisms behind the accumulation of disadvantage, forming a uniform understanding of accumulated disadvantage has been hindered by the fact that disadvantage has been measured in many different ways (Callander, Schofield, and Shrestha 2012a). Especially there has been variation in regards to which dimensions of disadvantage have been taken into account in the analyses. Usually only two dimensions have been examined simultaneously (often health and socioeconomic disadvantage).

In Finland, there is a long tradition of researching the disadvantage discourse, but there are only a few longitudinal studies that have empirically examined the accumulation of disadvantage throughout several life phases. Many of them have focused on health (Kestilä et al. 2008; Rantakallio 1988; Rintanen 2000), psychological factors (Pulkkinen et al. 1996) or used register data (Paananen and Gissler 2012) and only a few have collected all the information prospectively (Pulkkinen et al. 1996).

This study aims to broaden our current understanding of the accumulation of disadvantage. It views disadvantage from a multidimensional perspective covering several forms of disadvantage (health, social relations, socioeconomic factors, and risky behaviour). This study uses long prospective follow-up data collected by the Stress, Development and Mental Health Study (TAM-project), which provides opportunities to study disadvantage as a temporal process extending from adolescence to midlife. The

study approaches the accumulation of disadvantage from various different perspectives using life-course models of clustered accumulation, chain of risk, and accumulation of disadvantage (Kuh et al. 2003).

2 Disadvantage over the life course

The framework of this study is based on two research traditions: disadvantage and the life-course perspective. Both of these approaches are complex and multidimensional; disadvantage can manifest itself in several different ways and every life course is unique. Both of these perspectives consist of several theories and viewpoints. The following section outlines their main characteristics.

2.1 Disadvantage

The definition of the concept disadvantage has been and still is under constant development and debate. The following outlines the main characteristics of the multiple perspectives to disadvantage.

2.1.1 The concept of disadvantage

Disadvantage is a broad concept, which has many definitions, with the range of concepts related to disadvantage being wide. Some studies prefer concepts like *underpriviledge*, *deprivation* and *poverty*. The previous literature also contains many concepts that refer to the multidimensional aspect of the concept, such as *multiple social disadvantage* (Manderbacka et al. 2014), *cumulative disadvantage* (Dannefer 2003; O'Rand 1996), *accumulating disadvantage* (Korpi 2001), *welfare problems* (Halleröd and Bask 2008), *multidimensional poverty* (Bourguignon and Chakravarty 2003; Callander and Schofield 2014) and *multiple deprivation* (Figari 2012). The nature of the concept is vacillating, but all these concepts refer to problems in wellbeing.

The concepts of exclusion and marginalisation are often related to disadvantage and sometimes are even used as synonyms. These concepts require definition of where a person is excluded from. Exclusion can be seen from economic, political, or social perspectives. Many see exclusion or marginalisation as a position or a process that deviates from the normative society. Disadvantage and especially an accumulation of it can (but does not necessarily) lead to exclusion from society. Disadvantage has often been seen as a static state and exclusion as a process (Berghman 1995).

2.1.2 Different perspectives to disadvantage

Who is disadvantaged is always a matter of definition. The concept of disadvantage can be viewed from different perspectives (e.g. Karisto 1984). Many theories have discussed disadvantage in relation to a person's *needs*, *resources* and also in relation to *functionings and capabilities*. Other perspectives concern the *objective vs. subjective* and *absolute vs. relative* nature of disadvantage. The concept of disadvantage can also be viewed from an

individual level vs. social or structural level. Thus, there are several different possibilities for defining the concept depending on the chosen viewpoints in these approaches. Each of these approaches are variously reflected in previous perceptions and measurements of disadvantage.

Needs, resources, functionings and capabilities

The concepts advantage and disadvantage take an evaluative statement regarding what is considered to be included in an advantaged or disadvantaged life. Several biological, psychological, philosophical, and sociological theories of needs have been proposed (e.g. Maslow 1943). If the needs of a person are not satisfied, then a person can be seen as disadvantaged. However, the perceptions of what needs are essential to satisfy in order to gain a good life have varied. For example, Erik Allardt (1972) approached the issue from a positive point of view and defined dimensions of wellbeing based on fundamental needs.

Defining disadvantage as unsatisfied needs has not brought about a consensus in the definition of disadvantage, thus other approaches have been developed. In the 1970s disadvantage started to be seen as a lack of resources. Sten Johansson (1970) stated that wellbeing is determined by the available resources, by means of which a person can control and guide their wellbeing. Resources can be viewed as opportunities to satisfy needs. Peter Townsend (1979) based his views of disadvantage on resources, but he restricted his perspective more to material resources and living conditions.

Some theorists have taken these approaches based on needs and resources further and claimed that advantage and disadvantage are not a matter of possession of resources or preference satisfaction, but rather about the ability to do and be (Wolff and De-Shalit 2007). Amartya Sen (1982) defined disadvantage (poverty) as a lack of capabilities and functionings. He sees achieved functionings as constituting a person's wellbeing, and their capabilities as constituting a person's opportunities to gain wellbeing. In addition to income, people need several other capabilities to function effectively in society. Sen also includes the concept of substantive freedom of choice in his understanding of disadvantage. A disadvantaged person does not have genuine freedom to make choices in ways of living. A person can choose his/her career, social life, leisure activities etc. only if he/she has capabilities, such as education, health, material resources and social networks to carry out these choices. The concept of 'freedom poverty' has been introduced in Australia based on Sen's ideas (Callander, Schofield, and Shrestha 2012b).

In addition to deficits in needs and resources and low capabilities, disadvantage can be understood as a lack of human, financial, physical, and social capital (Bourdieu 1986; Coleman 2000). Financial and physical capital refer to material capital, such as different forms of wealth; human capital refers to the skills and competence of a person; while social capital exists in social relations between persons. All these forms of capital facilitate activity (Coleman 1988).

Absolute vs. relative and objective vs. subjective disadvantage

Niemelä and Saari (2013) have classified measures of disadvantage according to two perspectives: absolute vs. relative measures and objective vs. subjective measures. There have been differing views regarding whether disadvantage should be viewed in relation to some absolute standards, in relation to others, or perhaps even in relation to a person's earlier situation. Niemelä and Saari state that an important question in aiming at reducing inequalities is how the disadvantaged differ from other groups. Many researchers support this relative approach and usually people are defined as disadvantaged compared to individuals or groups in less disadvantaged situation. For example, Peter Townsend (1979) defined the disadvantaged as those whose resources to participate in the average lifestyles, habits, and activities were below that of the average person. He stated that the degree of necessity is not uniform and we can assess needs subjectively, collectively, and objectively.

In addition to the absolute vs. relative perspectives of disadvantage, the concept can be approached from objective or subjective perspectives. According to the subjective approach each individual is best at evaluating the level of their own advantage/disadvantage. This approach emphasizes the perceived quality of life, whereas objective approaches suggest that wellbeing or the lack of it is a state or condition rather than a state of mind. The problem in the subjective approach is that the standards of disadvantage change according to the individual or group, and in the objective approach the concept of disadvantage is always defined by someone and it does not necessarily meet the views of others. It has been suggested that the best method to examine disadvantage is to use both objective and subjective measures simultaneously (e.g. White and Rogers 2000; Wolff and De-Shalit 2007), since these approaches intertwine. Even a subjective evaluation of one's disadvantage is not independent of the environment (Karisto 1984).

Individual vs. structural disadvantage

In these definitions the focus is easily put on the individual instead of society. Even though most disadvantage research focuses on individuals, it should be acknowledged that disadvantage is in many ways formed at the macro level, such as in social and institutional structures. In other words, disadvantage on a personal level is affected by personal, social, and environmental factors. This structural approach is important, especially to the relative perspective of disadvantage, since the level of a person's wellbeing or disadvantage is evaluated in relation with the social group a person belongs to. The resource approach emphasises that the resources are dependent on the environment in which they exist (Karisto 1984).

Although there has always been cultural diversity between societies, previously people within western societies lived a more culturally uniform life, why its ideals and preferences regarding what was to be included in a satisfactory life were more easily identifiable. Nowadays societies are more complex and possibilities for different employment and family formation paths have increased (e.g. O'Rand 1996). The increase

in divorces and single parent families as well as changes in the labour market and difficulties in balancing labour and family life are examples of new social risks that make the profile of the disadvantaged more versatile than before (Armingeon and Bonoli 2006; Esping-Andersen 1999). Thus, it has become more and more difficult to define what is required to achieve wellbeing. For example, many people have purposely decreased their income and expenditure for environmental reasons and do not view themselves as disadvantaged. However, research on disadvantage is often research on inequality. The relevant question is whether people have the same opportunities.

2.1.3 Dimensions of disadvantage

A monist approach suggests that all goods can be reduced to a single good or source, while a pluralist view emphasises that not all advantages (goods) and disadvantages are comparable, although some goods are of the same type and can be categorised (Wolff and De-Shalit 2007). Disadvantage needs to be examined from a multidimensional perspective. Thus, in order to understand disadvantage, a comprehensive approach to a person's life is required. A person or a group may be defined as disadvantaged in one dimension of life but not on another. These different dimensions of life can represent potential resources (e.g. Townsend), capabilities (e.g. Sen) or capital (e.g. Bourdieu) that enable a person to fully participate in society.

Originally disadvantage was seen as poverty, particularly low income (Vähätalo 1994). However, broader views emerged already decades ago (Allardt and Uusitalo 1972; Johansson 1970; Jyrkämä 1986; Rauhala 1988; Rutter and Madge 1976; Townsend 1979). Gradually the broader definition of poverty expanded to encompass non-monetary indicators. The other dimensions of life – besides monetary resources – that should be taken into account varies (see table 2.12 in Alkire 2002). Awareness of these other aspects of disadvantage has increased especially through the work of Amartya Sen in the reconceptualization of poverty (Sen 1982). Now many political quarters such as the European Union have accepted this multidimensional approach as a tool for policy design (e.g. Atkinson, Marlier, and Nolan 2004; Callander, Schofield, and Shrestha 2012b; Stiglitz, Sen, and Fitoussi 2009). This multidimensional approach views disadvantage as something that can cut across several dimensions of life. In Finland and Sweden disadvantage has been viewed within the framework of welfare states as welfare problems (Niemelä and Saari 2013).

Disadvantage can be viewed in any dimension of life that potentially could produce wellbeing or disadvantage in a person's life. The focus in this review is on the categories that are based on needs and resources, since they are most frequently used in empirical research. For example, Martha Nussbaum has developed categories based on functioning and capabilities (see list e.g. in Wolff and De-Shalit 2007), but they are beyond the focus of this study. The assumption of what is normal development is built into the concept of disadvantage on life paths (Uhlenberg and Mueller 2003). Although wellbeing and disadvantage can be seen as somewhat subjective concepts, they have usually been defined to include rather similar, somewhat overlapping dimensions in life. For example,

Uhlenberg et al. (2003) divided wellbeing into four categories: survival and physical health, emotional and mental health, social relationships and socioeconomic position, with many researchers from Finland (e.g. Jyrkämä 1986; Rauhala 1988; Ritakallio 1991) and elsewhere (Callander, Schofield, and Shrestha 2012a; Rutter and Madge 1976) following a somewhat similar classification. In the following sections socioeconomic disadvantage, health disadvantage, social disadvantage and risky behaviour are covered.

Socioeconomic

As the multidimensional concept of disadvantage was originally expanded from monetary and economic problems, it is natural that this dimension of disadvantage is well represented in the various categorisations of disadvantage.

Socioeconomic disadvantage plays a crucial role in creating inequality between people (Marmot 2005). Socioeconomic disadvantage can be operationalised in several ways related to economic adversities, such as low income, welfare reliance, or more self-perceived indicators e.g. low satisfaction with financial situation. In some, economic disadvantages have been seen as separate from other dimensions of socioeconomic disadvantage (education, employment and occupational status), but in some categorisations, all the aspects of socioeconomic wellbeing or disadvantage have been included into the same category. (Galobardes et al. 2006a; Galobardes et al. 2006b) In children and adolescents this dimension has often included parental socioeconomic problems, as well as problems in school attainment and school dropout (Koivusilta, Rimpelä, and Kautiainen 2006).

Health

In addition to the socioeconomic dimension, a multidimensional approach to disadvantage usually covers also health issues. Disadvantage in the health dimension can be measured as illnesses or various physical or psychological symptoms, but also as feelings of pain and agony and lowered ability to perform different functions in life. Health is an important part of wellbeing, but it is also a resource in gaining wellbeing. Poor health can limit a person's participation in different dimensions of life, such as work life, social relations, and education. In addition, mortality has been seen as an extreme end point of disadvantage (Blomgren, 2005; DiPrete & Eirich, 2006).

Social

A sense of belonging and other aspects of social relations have also been an important part of the concept of wellbeing/disadvantage, although not that widely covered in empirical studies (Allardt and Uusitalo 1972). Most often social disadvantage has been seen as a lack of family or as living alone. Nowadays it is often a matter debate as to whether this issue should even be viewed as disadvantage. Nevertheless, divorce or living alone have often been associated with several other disadvantages, such as poor health (Robards et al. 2012). In addition to these structural indicators of social disadvantage, such as family structure, an increasing number of studies have included other social measures, such as measures of perceived social support and loneliness. Supportive social conditions have

often been stated to protect from disadvantage in other dimensions of life and their lack might be related to an accumulation of disadvantage (e.g. Umberson et al. 2014).

Risky behaviour

Disadvantage is also linked to ways of life and lifestyles. Disadvantage is not defined as just problems in wellbeing, but also as lifestyles less valued by the majority (Niemelä and Saari 2013; Waxman 1983). For example, disadvantage has been seen to manifest itself as criminal behaviour (Laub and Sampson 1993). In research on multidimensional disadvantage, risky behaviour has not usually been seen as a dimension of disadvantage as such, but it is something that can also be viewed as a form of disadvantage in the sense that risky behaviour can limit a person's wellbeing and participation in normative activities in society (Wolff and De-Shalit 2007).

2.1.4 Several ways to measure disadvantage

Some of these forms of disadvantage can be understood as disadvantage as such (e.g. low income), others can be seen as forms of disadvantage, but are more or less also factors exposing to disadvantage (e.g. living alone). Wolff and De-Shalit (2007) have pointed out that sometimes people are disadvantaged because they are exposed to risks. For example, a person using alcohol heavily exposes himself/herself to several other health, social and socioeconomic disadvantages (Huurre et al. 2011). A disadvantage can be viewed as a lack of wellbeing, but also as a lack of resources to gain wellbeing in other life domains. These dimensions often intertwine and overlap, but examining them separately helps in analysing disadvantage as a study object (Jyrkämä 1986).

Various methods have been used to measure multidimensional disadvantage (Callander, Schofield, and Shrestha 2012a) and this variation in indicators has led to problems in operationalisation and validation and to criticism of disadvantage being a nebulous concept. Especially problematic is that the development of disadvantage indicators requires a statement on where to draw the line between the advantaged and the disadvantaged. For example, unemployment has often been seen as a form of disadvantage, but it raises many questions, such as are short periods of unemployment included or should they be viewed as a normal part of job mobility. Further disadvantage is sometimes differently manifested in different age phases and this might complicate the measurement of disadvantage. For example, income, employment, or housing have usually not stabilised in young adults (Kainulainen 2006) and gaining an education might temporarily increase disadvantage, especially economically.

Helne (1994) has analysed ways to examine disadvantage and social exclusion. She places studies into three dimensions: quantitative vs. qualitative research, research at the societal, group and individual level, and studies understanding the phenomenon as a process vs. a state.

Disadvantage has been studied both with qualitative as well as quantitative measures. Quantitative methods have mostly focused on research on poverty and general living conditions. Previous studies suggest that non-response in surveys is more common among

the most disadvantaged groups (Niemelä and Saari 2013). Qualitative measures have often been used to reach marginal groups such as prisoners or the homeless. Both methodological approaches are needed in understanding disadvantage.

The debates related to the concept of disadvantage and empirical research have not always met. There is no uniform way to measure multidimensional disadvantage. In some studies, multidimensionality is seen as indicators in different dimensions of disadvantage, but they are mostly studied separately, though some studies examine indicators simultaneously and their interactions, and some have formed so-called disadvantage indices, which combine indicators from several dimensions of life. As study objects, different forms of disadvantage can be seen as risk factors for later adverse outcomes (disadvantages) or problems in wellbeing in itself.

2.2 Life-course perspective

The life-course perspective covers a wide range of concepts and theoretical and methodological approaches that aim to study lives across age phases (Shanahan, Mortimer, and Kirkpatrick Johnson 2016). The first pioneering life-course studies began in the 1910-1920s in the USA (Bynner 2016). However, only decades later did the life-course perspective start becoming common in science (Elder, Kirkpatrick Johnson, and Crosnoe 2003). A life-course perspective has been utilised in many studies on temporal phenomena. Especially chronic disease epidemiology has developed a life-course perspective and many conceptual models originate from this study field. Nowadays the life-course perspective has increased interest widely among other study fields, as well as among other actors beyond academics (Kuh and Ben-Shlomo 2004b; Shanahan, Mortimer, and Kirkpatrick Johnson 2016).

2.2.1 A definition and the roots of the life-course perspective

The life course is a process, which is shaped by interlocked biological, physiological, psychological, social, and historical factors. In previous literature, several different concepts, such as *life course, life span, life cycle, life history* and *ageing,* have been used interchangeably, though it has been recognised that they have somewhat distinct features (Alwin 2012). These distinctions in the concepts have reflected the different disciplines using them. Roughly speaking, life cycle refers to the biological perspective of human development and the life span is more psychologically centered (Alwin 2012). The biological development of humans refers to biological characteristics and changes in the organism, as well as to ageing, beginning from birth and continuing until death. The foetal period has an important role in the physiological development of humans and genetic and environmental factors affect it (Barker et al. 2002; Shanahan 2013).

In addition to biological approaches, several psychological theories have been developed to better understand human development. Many of these theories (e.g. Bronfenbrenner 1977; Erikson 1978; Havighurst 1953) have been gathered under the

concept developmental psychology. Common to most of these theories is the perception that individuals face several different developmental stages and tasks over time and how they manage the previous stages and tasks determines how they will manage the subsequent stages (see also Baltes, Lindenberger, and Staudinger 2006). A life span developmental perspective focuses on the processes and experiences occurring through life. It views development and ageing as multidimensional and multidirectional processes (involving gains and losses) (Alwin 2012). It takes into consideration the multiple contexts in which the development occurs and the interaction with social settings.

This life-span developmental perspective has been moved away from unilinear, organismic and deterministic models towards more contextual, adaptive, probabilistic and self-organizational dynamic aspects of human development (Baltes, Lindenberger, and Staudinger 2006). However, some have thought that this perception downplays the role of social components of development (e.g. role of social relations, structures, institutions, and historical change) in explaining the processes through which the life course is constructed (Bynner 2016; Mayer and Schoepflin 1989).

These biological and psychological approaches have been seen as deterministic, fixed, and universal and not allowing many possibilities for deviation. The concept of life course was adopted by sociologists to gain a more sophisticated and flexible tool for understanding human development (Alwin 2012). It combines influences from biological and psychological approaches to human development and in addition emphasizes the embeddedness of human development in social structures and historical change (Elder 1998; Lerner 1996; Schoon 2006). The essential point of view in the life-course perspective is that development extends over the entire life and behaviour cannot be fully explained by restricting analysis to specific life stages (Baltes, Lindenberger, and Staudinger 2006; Elder 1998; Schoon 2006).

2.2.2 Different life phases

Several biological, psychological, and sociological theories have focused on within-person change. These theories have often concluded that an individual's life comprises different life phases; *childhood, adolescence, early adulthood, midlife* and *old age*, though there has been variation in the timing and categorisation of these phases. It is essential to acknowledge that development does not end in adulthood, but is a lifelong process and the changes do not always mean an improvement in matters, but can also refer to a more negative progression (Baltes, Lindenberger, and Staudinger 2006).

Although there is a lot of individual variation in the timing of life phases, there are distinct features that have been linked with each life phase. Childhood is a time of rapid biological, psychological, and social development and the wellbeing and disadvantage of children is largely determined by the resources of the parents and family.

Adolescence is another period of rapid biological, cognitive, psychological, and social changes and development. Adolescence has sometimes been seen as a second crucial developmental period and a period of increased vulnerability (DiClemente, Hansen, and Ponton 2013; Viner et al. 2012). For example, mental health problems and alcohol use

usually begin during adolescence. Adolescence has been seen as a time when people are particularly impressionable (Alwin and McCammon 2004), but although the influence of peers and media increases, family still retains in an important role in the adolescent's life (Aaltonen and Karvonen 2016). Despite risks related to adolescence, the changes that take place in adolescence are also opportunities. Due to physical and psychological maturation as well as many changing roles and environments, adolescence is an important life phase regarding the subsequent life paths.

Early adulthood is the time of independence and many transitions. The five different transition markers – the big 5 – include educational attainment, work status, leaving the home of origin, romantic partnership, and parenthood (Schulenberg and Schoon 2012; Settersten 2007). However, early adulthood is still often a time of experimenting with different adult roles and the choices made are not necessarily adopted for life.

Adulthood is usually the time of family formation and gaining a permanent job. In midlife, the settling down has often already happened in many ways (intimate relationship has stabilised, the role in work life has been clarified etc.). However, for many, it is the time of reassessment of own life and changes in the social relationships, life style and in the sense of self can occur also in this life phase. Moreover, old age is a life phase that brings changes: work life usually ends due to retirement and there might be changes in marriage/family as well as in health.

This basic categorisation of life phases has retained its relevance in society. However, at an individual level the focus is more on the timing of different developmental stages, transitions, and pathways across life. Thus, when examining the individual life paths, it is sometimes problematic to use categorisations based on the population level categories, though they help to classify the life course.

2.2.3 Basic concepts of the life-course perspective

The development of the life-course perspective has led to a somewhat collectively shared understanding of five principles or paradigms for the life-course perspective: *development in context*, *human agency*, *linked lives*, *timing* and *location in time and place* (Elder and Giele 2009; Elder, Kirkpatrick Johnson, and Crosnoe 2003). The first principle underlines human development as a lifelong process and the interplay between a changing individual and a changing context (Schoon 2006). The second principle emphasizes that individuals actively shape their own life course by choices and actions they take within social influence and structural constraints. The third principle highlights that individual lives are lived interdependently and as part of a network of social relationships. The fourth principle expresses the importance of timing in the life course. The same experiences might affect individuals differently depending on their timing. The final principle stresses the historical time as well as place (geographical and group membership) as a life context. When historical changes influence different birth cohorts differently, cohort effects occur and when the influence is somewhat uniform, period effects occur (Schoon 2006).

The life course concept refers to *life events*, *trajectories*, and *transitions* throughout life (e.g. Hutchison 2015). A life-course perspective views life as pathways of changes and

continuities. The transitions through the life course are often normatively patterned and involved with institutions. Each transition is an opportunity for a change in life course. It has been stated that the focus in life-course studies is moving away from normative patterns towards multiple developmental paths. The components of these paths interact with each other and also with social and physical environment (Bynner 2016; Schulenberg and Schoon 2012). Thus, there are less and less normative paths in life and the possible paths are now more complex than ever. On the other hand, it has also been suggested that the life course has become more standardized by age and more tied to institutions, such as starting school. There is empirical evidence on both standardization and individualization of the life course (Shanahan 2000).

2.2.4 Life-course models

Kuh et al. (2003) have distinguished life-course models to be utilised in epidemiology. These models can also be applied to life-course research in wellbeing and disadvantage more generally. They categorised the concepts related to the life course into three categories. The first refers to conceptions of a causal pathway in relation to time. These include accumulation, chain of risk, and trajectory models. The second category refers to the timing of causal actions, such as critical and sensitive periods. The third category refers to different types of mechanisms, such as mediating and moderating factors, resilience, susceptibility and vulnerability. The following outlines mainly the models in the first category, i.e. the models that are adopted as the framework for this study, but introduces also a few other models, since these mechanisms are important to understand when examining these other models.

The concept of *accumulation* refers to gradually collecting or amassing something (Ferraro and Shippee 2009). Accumulation might refer to increase in the number, duration, or severity of exposures (Kuh et al. 2003). When Kuh et al. (2003; 2004b) analyse the concept of accumulation, they specifically refer to accumulation of risks. They divide the risks into independent (Fig. 1a) and clustered risks. Clustering of risks is a temporal process and Kuh et. al (2003) refer to this longitudinal clustering of risks. However, sometimes it might be interesting to examine the total burden of exposures a person has at one point in time and thus clustered risks can also be examined with a cross-sectional approach (Fig. 1b).

The concept of *trajectory* has been used to describe a long-term pattern of stability and change – in other words a process of change. Trajectories imply accumulations of experience stretching over the life course (Fig. 1c) and are differentiated from *transitions* that refer to changes in states or roles, such as getting married (Schoon 2006). Elder et al. (2003) see life trajectories as sequences of roles and experiences defined by transitions; or in Alwin's (2012) words 'each life course transition is embedded in a trajectory that gives it specific form and meaning *within a specific phase of the life cycle*…'. Kuh et al. (2003) define a trajectory as 'a long term view of one dimension of an individual's life over time'. Since people live their lives in several spheres or dimensions, their lives are formed

by multiple different intersecting trajectories (e.g. health trajectories, work trajectories etc.) (Hutchison 2015).

A *chain-of-risk model* or *a pathway model* refers to sequence of linked exposures. These exposures or risk factors form chains of risks where risk or adversity in earlier life increases risks or adversity in later phases of life, thus forming a chain of associations linking childhood conditions to adulthood. This situation has also been referred to as a chain reaction or a vicious circle and the determinative nature of these concepts has also been critisised (Dannefer, Kelley-Moore, and Huang 2016). Kuh et al. (2003) emphasize that the sequential links are probabilistic rather than deterministic in nature.

The chain-of-risk model is a part of a broader Path Dependency framework which includes several theories attempting to articulate how adult outcomes are manifested from previous experiences through the life course (Dannefer, Kelley-Moore, and Huang 2016). Kuh et al. (2003) distinguished two types of chain-of-risk models. The first is an additive model, where each exposure increases the risk of a subsequent exposure, but they also independently increase the risk of the outcome. This is usually a case of a dose-response effect, indicating that the more exposures the more increased the risk (e.g. life-long smoking). The second type of chain-of-risk model refers to a situation where earlier exposures do not have an independent effect on the outcome, but the effect is possible only through the final link to the outcome. For example, alcohol use increases the risk of getting into of a fatal traffic accident, but the cause of death is not alcohol, but the injuries caused by the accident. These chains of risk often include mediating or moderating factors. These mediation paths are often referred to as indirect paths/effects (Fig. 1d). Early life conditions are usually associated with adult wellbeing via not just one but several different mediators simultaneously. This situation, where one exposure is a risk factor for several adversities simultaneously (which further simultaneously act as risk factors for subsequent adversity), can be seen as a special case of accumulation.Thus chain-of-risk model can often be a complex web of associations i.e. a model of multiple mediations (Fig. 1e).

A *critical period model* implies a certain critical period of development in which an exposure has long-term effects on the adult wellbeing independent of later life exposures or in interaction with later risks (a critical period with latent effect modifiers). A *sensitive period model* resembles the critical period model, but the exposures do not have an effect independently of later exposures to subsequent wellbeing, but rather they have a stronger effect than it would at other times (Kuh et al. 2003).

Kuh et al. (2003) point out that these life-course models are not mutually exclusive, but rather might operate simultaneously. For example, disentangling separate and cumulative effects is a complex process. Theoretical models often suggest causal pathways, but when different dimensions of life intertwine, the direction of causal relations becomes blurred and might be difficult to verify.

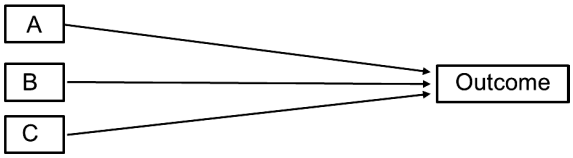


Figure 1a Independent risk model

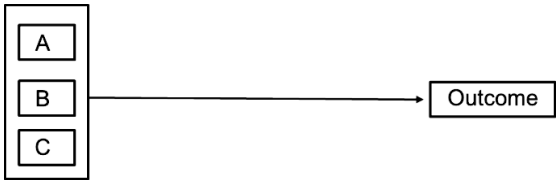


Figure 1b Clustered accumulation model (cross-sectional clustering)

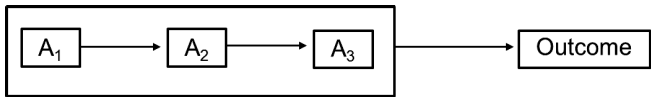


Figure 1c Cumulative model (trajectory model, multiple exposures to the same risk factor)

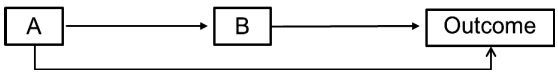


Figure 1d Chain-of-risk model (path model) (mediation)

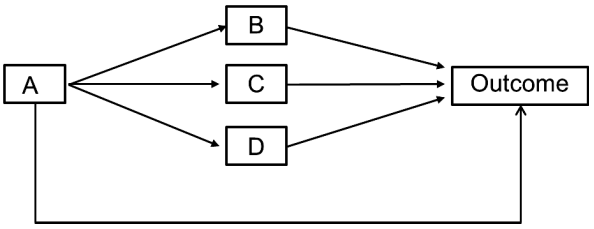


Figure 1e Multiple chains of risks model (multiple paths model) (multiple mediation)

Figures 1a-e Life-course models (Modified from (Kuh et al. 2003))

2.3 Cumulative disadvantage

There have been some attempts to combine these two research perspectives: multidimensional disadvantage and the life course (Dannefer 2003; Ferraro and Shippee 2009; Shanahan 2013), but the undertaking is still in its early stages. Since it has been concluded that multiple risk models are generally better predictors of individual outcomes than single risk models (Ackerman et al. 1999; Schoon 2006), the multidimensional approach to disadvantage is well suited to being utilised in life-course research.

The research literature on *accumulation of disadvantage* (or *cumulative disadvantage*) often refers to the Matthew effect. Robert K. Merton introduced the concept in 1968 to describe the unequal distribution of rewards in science. The scientists who are already famous or successful are more likely to be rewarded than other less notable scientists (Merton 1968). Definition of the Matthew effect has since broadened to general wellbeing and is referred to as an 'inequality-generating process' (see Dannefer 2003). The advantaged group gain more wellbeing, and in groups that are worse off, the disadvantage accumulates.

Accumulation of disadvantage is a process, where previous disadvantage affects later disadvantage. However, previous studies have interpreted and examined the accumulation of disadvantage from various perspectives, which has for its part broadened and blurred the definition of the concept. The concept has been viewed from individual and structural (population level) approaches. It has often been interpreted in a way that unequal distribution of advantage and disadvantage grows over time (DiPrete and Eirich 2006). Dannefer (2003) described it as a 'systemic tendency for interindividual divergence in a given characteristic (e.g. money, health, or status) with the passage of time'.

The concept of 'accumulation of disadvantage' has been used to refer to models of clustering, accumulation, and a chain of risk (see paragraph 2.2). Even though accumulation of disadvantage is a temporal process it can be examined in a cross-sectional way. Some studies have examined cumulative disadvantage as the distribution of multifactorial disadvantage, in other words as a situation in which multiple forms of disadvantage exist simultaneously at one point in time (see e.g. deprivation in Berghman 1995; Kainulainen 2006; Kortteinen and Tuomikoski 1998; Stuart 2006). This perspective is influenced by a life-course model of risk clustering (Fig. 1b). Other studies refer to the accumulation of disadvantage as a situation where one form of disadvantage prolongs (e.g. long-term unemployment) or is present in several different life phases (Fig. 1c) (see list in Pollitt, Rose, and Kaufman 2005). Some studies have viewed accumulation of disadvantage as a process where one form of disadvantage is associated with another form of disadvantage in a different dimension of life (e.g. Rönkä 1999), this type of 'accumulation of disadvantage' refers to the chain-of-risk model (Fig. 1d and 1e).

Previous studies have often stated that one form of disadvantage does not necessarily affect quality of life if other circumstances in life are well balanced. The most detrimental disadvantage is usually the kind that extends to several dimensions of life and there is not sufficient wellbeing in life to compensate for the disadvantages (Jacobs et al. 2012).

In addition to duration and extent of disadvantage, the timing and way an accumulation occurs has a role in the severity of the negative outcomes. Thus, the

childhood and adolescence disadvantage is linked to adulthood wellbeing and disadvantage via multidimensional and multifactorial effects. These effects have sometimes been called 'cascading effects', in which changes in one dimension of life can bring about changes in other dimensions (Masten 2001; Schoon 2006; Wolff and De-Shalit 2007).

The process of accumulation of disadvantage that links childhood and adolescent conditions to health disadvantage have been suggested to work via biological and social processes (Power and Hertzman 1997). Blane et al. (2007) have described accumulation as an underlying social process driving life-course trajectories. These social processes or paths determine adult wellbeing. Social paths in early adulthood such as education, work, family, and residence can mediate the association between childhood/adolescent experiences and adult wellbeing (Elder, Kirkpatrick Johnson, and Crosnoe 2003).

Biological programming is a life-course model that hypothesises that adult health and its risk factors are genetically or biologically programmed during critical periods of growth and development in utero and in early infancy (e.g. Barker et al. 2002). These biological and social elements often interact with each other (Blane, Smith, and Hart 1999).

In theoretical approaches to disadvantage, gender has not been a focal point, although many studies have found gender differences in the distribution as well as in the accumulation and pathways of disadvantage. Gender distinctions are mostly socially constructed and gender has effects on social roles and relationships. A gendered life-course perspective emphasizes the role of gender in shaping men's and women's life paths (Moen 2001). Gendered life courses are shaped by cultural expectations and differing positions for example in the labour market and family life (Hagestad and Dykstra 2016). Even though men and women's life paths are becoming similar in many ways, for example regarding patterns of risky behaviour or family roles (Altintas and Sullivan 2016; Holmila and Raitasalo 2005), there are still inequalities by gender across the life course that can produce disadvantage (Moen 2001).

2.4 Disadvantage in this study

In this thesis, disadvantage is mostly viewed from the perspective of resources and the focus is on relative and objective aspects of disadvantage. The biological, social (including social relations and socioeconomic), health and life style processes interplaying in the individual development are acknowledged, but the focus is on other than biological processes. The concept of the accumulation of disadvantage is used in two senses: when referring to the cross-sectional and temporal multidimensional nature of disadvantage. Pohjola (1994) has described the definitions of disadvantage as generalized, static, normative and something that views disadvantaged people as passive objects. This study aims to respond to some of the critique by exploring disadvantage through the life-course perspective and trying to understand the individual pathways of disadvantage and wellbeing; the continuities and discontinuities in disadvantage processes acting through life.

3 Empirical evidence

A multidimensional approach to disadvantage enables an examination of the issue from numerous perspectives. We have selected (physical and mental) health, social relations, socioeconomic factors, and risky behaviour as dimensions of disadvantage to focus on. We have selected four points of view to approach accumulation of disadvantage and this review of the literature has been based on these approaches. The aim has been first to map adolescent disadvantage from a multidimensional perspective and to explore, based on previous studies, which disadvantages play the most important role in determining the extreme endpoint of disadvantage - mortality. Then the aim is to focus more thoroughly on social relationships that have not been the focus of previous studies on accumulation of disadvantage. Here we focus on family relationships, since they are our primary social relations, especially in childhood and adolescence. Thereafter we review the literature on pathways to economic adversity and mental health and consider previous studies on how family relationships play a role in these paths. Finally, we focus on alcohol use, which represents a dimension of risky behaviour. This is another dimension of disadvantage that has not usually been the focus of theoretical and empirical work on disadvantage.

3.1 Determinants of mortality in adolescence and adulthood

Death can be viewed as an extreme example of health disadvantage, although health is not the only thing determining mortality. Death can also be seen as a final point in a pathway of disadvantage (Blomgren 2005; DiPrete and Eirich 2006). Much of the previous work in determinants of mortality has focused on determinants of prenatal, neonatal and postneonatal periods and adulthood (Montez and Hayward 2011), adolescent risk factors have not grabbed as much attention.

Mortality in adolescence and early adulthood is rather rare in Finland and other parts of Europe. For example, a little over two per cent of 15-year-old men and less than one percent of women die under the age of 35 (Martelin, Koskinen, and Valkonen 2005). In 2015 of all adolescents or young adults aged 15-40 years, 1029 (0.06%) died (Statistics Finland 2016a).

Causes of death vary by age. For high and middle-income countries, the most important risk factors for mortality are those associated with chronic diseases e.g. heart diseases and cancer (World Health Organization 2009). However, when examining mortality in adolescence and early adulthood, causes of deaths in these age groups are usually potentially preventable causes (e.g. suicides, accidents) and not diseases (Saarela and Finnäs 2008).

There is a clear gender difference in the mortality rates as well as proportions of causes of deaths. As in adults, mortality rates in adolescents and young adults are significantly higher in men than in women in Finland. In adolescence and early adulthood men die more often by suicides and accidents. In women, the external causes are rarer (Saarela and Finnäs 2008) and diseases are more common.

Several studies have suggested links between childhood and adolescent disadvantage and mortality. Most evidence on determinants of mortality is by far on childhood/adolescent socioeconomic and health-related factors; some studies have examined contextual factors such as income inequality, access to health, and social services and crime rates (Hayward and Gorman 2004).

Several aspects of health, such as poor self-perceived health (Larsson et al. 2002), mental health problems (Bayard-Burfield, Sundquist, and Johansson 1998; Maughan et al. 2014) and poor physical health (Elo and Preston 1992), have been found to be associated with mortality. These associations are shaped by both biological and social processes.

Even though the association between social relations and health is widely recognized (House, Landis, and Umberson 1988), previous mortality studies have not focused on social relations on an equally large scale as on health and socioeconomic determinants of mortality (however see Holt-Lunstad, Smith, and Layton 2010). Parental divorce and childhood/adolescent family structure have been associated with mortality in various studies (e.g. Sauvola et al. 2001), and this association has been suggested to work via risky behaviour and socioeconomic and psychological factors (Pensola 2003). Far fewer studies have examined mortality and adolescent social relationships from other than a structural approach.

Family's socioeconomic environment is probably the most widely studied childhood/adolescent exposure to mortality (Montez and Hayward 2011) and numerous studies have found low childhood family's socioeconomic position (SEP) (parental education, occupation or income) to be associated with mortality (Cohen et al. 2010; Galobardes, Lynch, and Davey Smith 2008; Galobardes, Lynch, and Davey Smith 2004), although for some causes of death this association has been found to diminish after adjusting for adult SEP (Power, Hyppönen, and Smith 2005). Also, having non-employed parents has been associated with mortality (Vågerö and Leon 1994). However, many of these studies have not taken childhood health into account when examining the association between childhood SEP and adult mortality (Cohen et al. 2010). Adverse socioeconomic conditions have been suggested to strain future wellbeing via various pathways e.g. adult SEP, risky behaviour, and psychological distress (Due et al. 2011).

In addition to parental factors, many adolescent socioeconomic factors (e.g. poor school performance, low education, school drop-out and early experiences of unemployment) have also been found to be associated with mortality (e.g. Viner et al. 2012). Likewise with these measures of SEP, the association between childhood SEP and adult mortality has been found to be mediated by adult SEP (Hayward and Gorman 2004). Most of these previous studies have found a graded association between SEP and mortality. Education, health, and mortality are strongly linked and this association tends to grow over time (Lynch 2003; Miech et al. 2011). Health selection, i.e. people with poor health move down the social hierarchy, explains this association partly, but certainly not entirely. Educational attainment is usually associated with higher income, which enables higher quality healthcare and safer living and working environments (Crosnoe and Benner 2016). Education also increases social, cultural, and cognitive resources, which can further enhance health (Lynch 2003). In addition, decisions regarding risky behaviour (or not

engaging in it) might be based on valid information more likely with the highly educated (Ross and Wu 1995).

Adolescent and young adult mortality are often the result of detrimental lifestyle practices (DiClemente, Hansen, and Ponton 2013). Several studies have found adolescent alcohol use (Clark, Martin, and Cornelius 2008; Mattila et al. 2008), smoking (Mattila et al. 2008) and criminal behaviour (Laub and Vaillant 2000) to be associated with mortality. Heavy drinking has been recognized as one of the most significant public health problems in Europe (World Health Organization 2009). Alcohol use can be a risk factor for mortality, but often it is also the cause or contributory cause of death (Statistics Finland 2013). Globally smoking is one of the leading risks for mortality, accounting for 18% of deaths in high-income countries (World Health Organization 2009). However, rarely is the cause of death a disease caused by alcohol use or smoking in people under the age 40 (Saarela and Finnäs 2008). The risky health behaviour is more likely correlated with other risky behaviour and forms of disadvantage (e.g. poor mental health or criminality) that can result to e.g. in suicide or accidents (Bagge and Sher 2008; Stenbacka and Jansson 2014).

Some of these previously mentioned risk factors might have an independent role in subsequent mortality, but most likely these disadvantages are intertwined; some previous mortality studies have examined links between different risk factors (Joynt, Whellan, and O'Connor 2003; Smith and Waitzman 1994; Van Hedel et al. 2015; Voss et al. 2004; Yusuf et al. 1998). However, usually these studies have examined adult populations. Multiple risks in adolescence have been found to be associated with various subsequent adversities e.g. low SEP (Gutman, Sameroff, and Eccles 2002) and poor health (Pickett et al. 2002). However, studies that have examined multiple risks in adolescence (or early adulthood) on mortality have mainly examined risky (health) behaviours (e.g. Neovius, Sundstrom, and Rasmussen 2009; Raitakari et al. 1995).

An increasing number of studies have examined the clustering of disadvantage especially regarding socioeconomic disadvantage (e.g. Whelan and Maitre 2005), but the studies examining the association with mortality are still rare. Especially, there are few studies that have examined mortality and adolescent disadvantage from a holistic perspective and included also factors of social relationships and conditions. This is probably because usually studies that use reliable information on deaths are register studies and these register-based datasets give only limited possibilities to examine factors related to social relationships or behaviour.

Even though our focus here is on multiple risks in adolescence, it is likely that they are a part of chains of risks beginning before adolescence and continuing to later life phases. However, because adolescent disadvantage often continues into adulthood and is seen as a foundation for future health, adolescent wellbeing is important for the health and wellbeing of the whole population and thus requires special attention (Sawyer et al. 2012; Viner et al. 2012). Despite a wide range of literature emphasizing the importance of adolescence for subsequent wellbeing, there is not a very extensive literature on chains and accumulation of disadvantage from this perspective.

3.2 Childhood/adolescent family relationships' association with subsequent disadvantage

Social relationships have not received as much attention in research on disadvantage as other dimensions of disadvantage, thus this section reviews this issue more thoroughly. Childhood family conditions have been considered to have an important role in determining a person's wellbeing in childhood and also in setting up a foundation for wellbeing in later life phases. The family conditions can be viewed from three perspectives: structure, resources, and relationships (or interactions) (Uhlenberg and Mueller 2003). In previous studies examining the role of the family in determining life-course outcomes, the focus has been on family structure and resources. Family relationships and interactions have been studied to a much lesser extent in previous longitudinal studies on disadvantage, and those that have studied them have mainly examined mental health outcomes (Weich et al. 2009).

Good family relationships in childhood and adolescence can be associated with subsequent wellbeing via several mechanisms. In addition to providing material, social and cultural resources (Farkas 2003; Uhlenberg and Mueller 2003), parents also control and encourage their offspring and teach communication skills (Thoits 2011). All these different ways that parents can impact their offspring's wellbeing are easier to carry out if the relationship with the child is good. On the other hand, if the adolescent–parent relationship is not warm and supportive, it might be that the child cannot take advantage of the resources the parents have; thus poor family relationships might determine subsequent disadvantage (Astone and McLanahan 1991; Coleman 1988).

Poor family relationships have been found to be associated with poor somatic health, poor mental health, poor social relationships, lower socioeconomic factors, and risky behaviour (Barber, Stolz, and Olsen 2005; Burt et al. 2006; Crosnoe and Cavanagh 2010; Lynch et al. 2006; Schoon 2006). Most evidence found has been on the association between family relationships and child/adolescent outcomes (Parke 2004; Pollard and Lee 2003). Those studies that have examined long-term outcomes of childhood/adolescent family relationships have mainly studied outcomes in early adulthood (e.g. Roustit et al. 2011), while there is much less information on associations with midlife and later outcomes.

It is well documented that social relationships have an important role in determining physical as well as mental health (Umberson and Montez 2010). However, even though some previous studies have found an association between poor family relationships and poor health (Amato 1994; Barber, Stolz, and Olsen 2005; Landstedt, Hammarström, and Winefield 2015; Lundberg 1993), the long-term association is still in many parts unclear. In a systematic review of prospective follow-up studies, Weich et al. (2009) concluded that there is strong evidence to suggest that parental abuse in childhood is linked with common psychiatric disorders in later life. However, less support for associations between less severe family problems, such as family discord or lack of emotional support, and adult mental health has been found. Weich et al. (2009) concluded that since these less severe family relationship problems are much more common than abuse, it would be important to find out more about their possible impacts.

Poor childhood/adolescent family relationships have been seen as a risk factor for problems in later social relationships, especially with one's intimate partner and in marriage (Merz and Jak 2013; Santos, Bohon, and Sanchez-Sosa 1998). Family relationships are usually a person's first close social relationships and in these relationships the child composes his or her ways of interacting with others. These first experiences in social relationships shape the way a person interacts in relationships also later in life (Feldman, Bamberger, and Kanat-Maymon 2013).

Parenting styles, parental support and involvement have been found to be associated with educational achievement and other socioeconomic factors (e.g. unemployment) of the child (Astone and McLanahan 1991; Caspi et al. 1998; Coleman 1988), although some studies have not found this association (Huurre et al. 2006). It might be that if the interaction between the parents and the child is not constructive, the values of the parents' regarding education and work ethics do not transfer to the next generation.

The links between social relationships and risky behaviour are well-established (Umberson, Crosnoe, and Reczek 2010). Many of these studies have particularly examined associations between parental factors with offspring's alcohol use (Huurre et al. 2007; Lynch, Kaplan, and Salonen 1997). However, it is not clear how adolescent family relationships are associated with alcohol use after adolescence. Adolescence is usually the time of experiementing with alcohol and smoking and parents have a role in showing an example and controlling these experiences. If the family relationships are not open, warm, and supportive, it might be that the adolescents do not value their parents' restrictive opinions on alcohol and tobacco use and they more easily engage in these detrimental behaviours. It might also be that adolescents use heavy drinking as a way to ease the burden of difficult family relationships (Nolen-Hoeksema 2004).

In addition to family relationships affecting subsequent wellbeing, it might also be the other way around. Several problems related to family (e.g. economic adversity), parents (e.g. mental health problems) or the child/adolescent (e.g. conduct problems) might also affect family relationships negatively (Cummings and Davies 1994; Elder et al. 1992). Regarding the adolescents, for example problems in health, risky behaviour, school, or peer relationships may shape family relationships in adolescence.

It has been suggested that men and women react to stressful situations differently. Women tend to have more internalizing symptoms such as psychological symptoms, while men tend to have more externalizing symptoms such as heavy alcohol use (Aneshensel, Rutter, and Lachenbruch 1991). Regarding family relationships and subsequent wellbeing there are mixed findings on gender differences. Some studies have suggested that girls are more vulnerable to family conflicts than boys, but also opposite suggestions have been posed (Cummings and Davies 1994; Dornfeld and Kruttschnitt 1992; Gutman, Schoon, and Sabates 2012). These mixed findings have been explained by proposing that boys are more vulnerable to family conflicts as younger children and girls as adolescents, at least regarding mental health outcomes (Davies and Windle 1997). However, most studies on childhood/adolescent family relationships have not specifically examined gender differences, although gender has been used as a covariate in the analyses.

3.3 Pathways to economic adversity

In studies of disadvantage, economic aspects are well represented. One of the most explicit determinants of economic adversity (income level) is educational achievement, although cultural variation and other intermediating factors blur the effect (Autor 2014; Bowles, Gintis, and Osborne 2001; Harmon, Walker, and Westergaard-Nielson 2001). Education, occupation, and income represent three aspects of socioeconomic position that are tightly linked. Education prepares young people to enter the labour market and the position in the labour market usually substantially determines the economic situation of a person. In addition to education many other dimensions of life (e.g. health) have an impact on a person's economic situation.

Poor health has been found to have an effect on socioeconomic attainment (Goodman, Joyce, and Smith 2011; Huurre et al. 2005; Virtanen, Janlert, and Hammarström 2013) although there is also much evidence supporting SEP as affecting subsequent health (Muntaner et al. 2004). Poor health can cause difficulties in finding a job and also maintaining a job, which directly impacts the economic situation.

Regarding social relations, the strongest evidence is found for an association between marital status and economic situation. Divorce and living alone have been linked with economic adversity, although some studies, mainly from USA, have also found increases in earnings after a divorce in women (Tamborini, Couch, and Reznik 2015), probably due to divorce leading to former housewives entering the labour force.

Risky behaviour, especially alcohol use, has been found to be associated with subsequent economic adversity (Mullahy and Sindelar 1992). Alcohol use can consume a large percentage of a person's income, especially if the income is low. In addition, risky health behaviour can weaken a person's working ability. Thru these mechanisms heavy drinking can weaken a person's economic situation.

Most previous studies have found similar pathways to adult socioeconomic attainment in both genders: however, in some studies education has been found to be an especially important determinant of subsequent SEP in women, but this has mainly concerned older cohorts (Lahelma et al. 2004; Schoon 2008).

3.4 Pathways to mental health

A wide range of different individual, social, cultural, and socioeconomic risk factors for mental health problems have been found (Colman et al. 2014; Fisher and Baum 2010; Räikkönen et al. 2012). The processes or pathways shaping adult mental health can be crudely divided into biological and social pathways. In biological pathways, the factors that shape mental health in the life course are biological or genetic in nature, whereas social pathways to mental health are shaped by social conditions and interaction with the social environment. These two sets of pathways do not operate separately, but they rather interact (Avison 2016).

A widely used approach to examining pathways to mental health has been to view certain adverse conditions or disadvantages determining mental health as stressors

(cumulative stress). Sometimes these disadvantages in life might exceed a person's abilities to cope and adjust to them and this can risk his/her mental health later in life (Fisher and Baum 2010; Longest and Thoits 2012; Pearlin et al. 1981).

Previous mental health problems have been found to be one of the most pronounced risk factors for mental health problems in later life (Pelkonen et al. 2008). Also, poor physical health (e.g. many chronic diseases) can put a strain on a person's mental health. Diseases or physical symptoms may cause suffering and limit a person's abilities to participate in work and social life. Especially regarding many chronic illnesses, mental health effects have been found (Pinquart and Shen 2011a; Pinquart and Shen 2011b; Pinquart and Shen 2011c).

Social support and being married have been found to protect against mental health problems. Similarly, a lack of these protective factors has been found to be a risk factor for poor mental health (Fuhrer et al. 1999; LaPierre 2012).

Mental health problems are more common among persons with socioeconomic disadvantages (Muntaner et al. 2004) such as unemployment (Daly and Delaney 2013; Montgomery et al. 1999; Strandh et al. 2014), low education (Esch et al. 2014) or income (Muntaner et al. 1998). Many of these studies suggest that socioeconomic disadvantages precede mental health problems, but there is also some support for the opposite direction. For example, healthy people are most suitable to work, but participating in work life also promotes wellbeing (Blustein 2008; Moen 2016).

Risky health behaviour (e.g. alcohol use) has been viewed as a way to cope with adverse life situations or disadvantages, but it can also be seen as a socially learned habit (Kuntsche et al. 2005; Kwasnicka et al. 2016). Heavy alcohol use has been associated with subsequent mental health problems (Boden and Fergusson 2011).

It has been suggested that the pathways to adult mental health differ between genders (Elliott 2013; Longest and Thoits 2012; Meadows, Brown, and Elder 2006). For example, it has been suggested that women react by internalizing symptoms when fewer risk factors are present and in men the triggering of distress requires more risk factors (Longest and Thoits 2012). Several biological, psychological, interpersonal, and contextual explanations have been suggested to explain these gender differences in term of the frequency of, as well as pathways to, disadvantage (Garber 2010; Rutter, Caspi, and Moffitt 2003).

3.5 Pathways from poor adolescent family relationships to midlife economic and mental health problems via early adult disadvantages

Poor adolescent family relationships have been found to be associated with early adult disadvantages in several dimensions of life (health, social relations, socioeconomic factors, risky behaviour) (see references in chapter 3.2) and all these disadvantages in turn have been found to be associated with subsequent economic and mental health problems (see references in chapters 3.3 and 3.4). However, only a few studies have examined the indirect effects from adolescent family relationships to midlife economic situation or mental health via factors in early adulthood. Some previous studies have examined

pathways to midlife economic situation (or more generally SEP), but only rarely has the interest been in how adolescent family relationships shape these pathways. More common has been to examine the role of family structure or SEP. Furthermore, studies that have examined indirect effects from adolescent relationships to adult mental health, have mainly focused on the pathways via psychological factors, such as self-esteem (Englund et al. 2011; Roberts and Bengtson 1993; Shaw et al. 2004).

According to the family socialisation model (Crosnoe and Benner 2016) family relationships and interactions have a role in determining subsequent education beyond childhood family's socioeconomic disadvantage. Further, educational path interplays with work path, health path and paths related to social relations (Crosnoe and Benner 2016). Thus, risk factors for economic adversity and mental health problems are often interlocked. The forms of disadvantage mediating the association between family relationships and midlife disadvantage might appear independent or form chains of disadvantages with other forms and together mediate the association. For example, risky health behaviours in adolescence have been found to be associated with attained educational level (Koivusilta, Rimpelä, and Vikat 2003), which in turn is a strong predictor of income level.

3.6 Development of heavy drinking and disadvantage

Age has an effect on alcohol consumption through increased biological vulnerability to alcohol harms in adolescence as well as after midlife (Kuerbis et al. 2014; Squeglia and Gray 2016), but most importantly through various other factors related to the life course (e.g. psychosocial factors) (Mäkelä and Härkönen 2010). At the population level, alcohol use is often initiated in adolescence, the drinking increases and peaks in early adulthood, and after that slowly decreases (Johnstone et al. 1996; Karlamangla et al. 2006; Kuntsche, Rehm, and Gmel 2004). This is the case especially with binge drinking, while lighter drinking has been shown to increase up to midlife (Mäkelä and Härkönen 2010). In Finland drinking to intoxication is common and an essential part of the drinking habits (Tigerstedt and Törrönen 2007).

Alcohol use trajectories have previously been examined especially regarding alcohol use in adolescence and early adulthood (Maggs and Schulenberg 2005). Trajectory analyses have been seen as a useful tool in illustrating the individual differences in the life course pathways. Alcohol trajectory studies have usually found rather similar patterns of trajectory groups. Steady low drinking and steady moderate drinking are usually the most common groups found. Other drinking groups that have often been found are steady high and increasing groups (Maggs and Schulenberg 2005).

Most of the previous trajectory studies have examined adolescents and young adults and this might have influenced the grouping of alcohol trajectories, since in early adulthood, alcohol use generally increases significantly. The findings might be somewhat different if also age phases beyond early adulthood are included, in other words phases of general stability or decrease in the alcohol consumption. However, contrary to some studies that have found a peak in drinking in the 20s (Karlamangla et al. 2006; Kuntsche,

Rehm, and Gmel 2004), some Finnish and Swedish alcohol studies have concluded that alcohol use and binge drinking increase also after the early twenties (Härkönen and Mäkelä 2011; Virtanen et al. 2015). A prospective follow-up study that examined alcohol consumption from adolescence to midlife found six trajectory groups, but not a group of rapid decrease (Virtanen et al. 2015).

Many alcohol harms are specifically related to binge drinking and these harms can cover many dimensions of life (Klingemann and Gmel 2001b). However, the long-term effects of adolescence and early adulthood alcohol use are in part unclear (McCambridge, McAlaney, and Rowe 2011). It is known that alcohol use in adolescence often continues into adulthood and is associated with alcohol problems (McCambridge, McAlaney, and Rowe 2011), subsequent poor health (Room, Babor, and Rehm 2005), unemployment (Henkel 2011), problems with friends and other close persons (Pernanen 2001) and being single or divorced (Power, Rodgers, and Hope 1999). However, most of these studies have not captured the heterogeneities in the development of alcohol use.

Those studies that have examined associations between alcohol trajectories and disadvantage have mostly examined outcomes in early adulthood. Mixed findings have been found on the association between alcohol trajectories and health. Two studies found no differences in depression/mental health between different drinking trajectories (Hicks, Iacono, and McGue 2010; Hill et al. 2000). In one study those who increased their drinking from early adolescence to early adulthood had poorer mental and physical health than abstainers (Tucker et al. 2005). Regarding social relationships, a persistent drinking trajectory was associated with being separated, divorced or never married (Hicks, Iacono, and McGue 2010; Schulenberg et al. 1996). Mixed findings have been found regarding drinking trajectories and socioeconomic outcomes. Some studies have not found associations between drinking groups and employment status or income (Hicks, Iacono, and McGue 2010). One study found increasers to be less likely to complete high school than those who did not drink heavily (Hill et al. 2000) and one other study found that in women those who belonged to the drinking group that fluctuated had greater educational attainment than those in the increasing or rarely drinking groups (Schulenberg et al. 1996).

It is well known that men use alcohol more often and more detrimentally than women (Holmila and Raitasalo 2005; Mäkelä et al. 2006). Some studies have suggested that women are more vulnerable to alcohol related harms (Nolen-Hoeksema 2004), but it is unclear whether heavy drinking has similar effects on disadvantage in women and men.

3.7 Summary of the empirical literature review

Disadvantage can cut across several dimensions of life. Different forms of disadvantage create a complex network and operate throughout the life course. This literature review presents empirical evidence of the various ways that disadvantage is transmitted from adolescence to midlife. It shows how pathways of disadvantage are potentially shaped by various different disadvantages. Different forms of disadvantage can e.g. cluster, accumulate and form chains of risks through the life course. Disadvantage can cluster also

in very early stages of life. Adolescence is one of these early life phases that determines wellbeing in later phases.

Mortality as an extreme end point of accumulation of disadvantage is associated with several forms of adolescent disadvantage (poor health, lack of or poor social relations, low SEP, risky behaviours). Although some studies examining adult disadvantages and mortality have examined the interconnections between these different forms of disadvantages, it has not been common in studies on adolescent risk factors, such that disadvantages related to social relationships and conditions would also have been taken into account.

It is clear that social relationships have an important role in the accumulation of disadvantage. Childhood/adolescent family relationships are usually the primary social relationships of a person. Many studies have suggested that poor adolescent family relationships form a foundation for future wellbeing and poor relationships are associated with various disadvantages in early adulthood (e.g. poor health and low education). Previous studies have also suggested that these disadvantages in early adulthood act as risk factors for economic and mental health problems in midlife. Thus, the next step would be to examine whether these early adult disadvantages mediate the association between adolescent family relationships and disadvantage in midlife.

In adolescents and early adults, health is mostly determined by risky health behaviours such as heavy drinking. However, the effects of individual development in alcohol use are still not fully understood. Alcohol use and especially heavy drinking have been found to be associated with various disadvantages, but only in the past decades have these studies started to examine the individual diversity in the development of heavy drinking and only a few of them have extended the life phases studied beyond adolescent and early adulthood.

It is mostly well documented that childhood and adolescent disadvantages are associated with adult disadvantage. It has been stated that it is difficult to estimate how much childhood circumstances contribute to adult wellbeing or disadvantage, but it is possible to establish whether and how childhood circumstances play a role in adult wellbeing (Graham and Power 2004). However, the research on mechanisms linking these life phases together has only taken its first steps in mapping the complex net of forms of disadvantage in different dimensions and life phases. Thus there is a need to examine interdependence of different forms of disadvantage and their complex pathways and not just direct associations.

Understanding these complex pathways requires comprehensive, longitudinal, multi-wave studies (Schoon 2006). Thus, there is a growing number of prospective, longitudinal follow-up studies spanning from childhood or adolescence until midlife, though studies based on these kind of datasets are still mostly an exception rather than a rule and even in these studies the perspective to disadvantage could be much more comprehensive than it has previously been.

More studies with aim multidimensional longitudinal approach are needed to better understand the complexities of life. Many studies have examined the association between one form of adolescent disadvantage with another adult disadvantage. It might be that these associations have appeared stronger than they actually are, because not all aspects of

disadvantage have been taken into account simultaneously. Another shortcoming in several previous studies is that, when examining pathways to adult outcomes, childhood or adolescent wellbeing has not been controlled for in the analyses, blurring the interpretation of the effects found.

Often gender has been used only as a covariate in the analyses of accumulation of disadvantage, meaning the examination of gender differences has been somewhat superficial. Although there is rather firm evidence on the different distributions of certain forms of disadvantage such as mental health problems and heavy drinking among genders, it is not very clear as to whether the pathways of disadvantage from adolescence to midlife differ among men and women. For some time, studies have suggested that women tend to react to stressful life situations more internally, such as with mental health problems and men more externally, such as with heavy drinking or conduct problems (Aneshensel, Rutter, and Lachenbruch 1991; Huurre et al. 2010; Rosenfield 1999). However, there is mixed evidence regarding this division (Hill & Needham, 2013). In addition, evidence suggests that there are many other gender differences regarding disadvantages, e.g. in the form and quality of social relationships, with women usually reporting more emotionally supportive relationships (Umberson et al. 1996; Umberson et al. 2014).

4 The context and the aims of the study

4.1 The context of the study

One of the principles of life-course research is to acknowledge time and place, which shape the life course of individuals (Elder and Giele 2009). The distribution of disadvantage in a population is very much shaped by the social and political institutions and structures people live in. However, this study uses data only from a single age cohort in one city, and it cannot take into account the cohort effects in the analyses. However, it is important to acknowledge the context in which this study cohort has grown up.

This study examines a Finnish cohort born in 1967, who lived their adolescence in Tampere, a city in southwestern Finland, and covers a 26-year follow-up period from the beginning of the 1980s to 2009. This study cohort grew up in Finland at a time when the welfare state was being cemented and expanded. The 1980s was the time of economic growth, employment situation improved, health and social services increased, and social security improved (Nordlund 2000). Thus, those born in the 1960s have sometimes been referred to as the welfare generation (Järvensivu, Nikkanen, and Syrjä 2014).

Despite living at a time of growth in welfare, this study cohort has also faced two periods of economic recession. During the recession in the early 1990s the unemployment rate increased from 4–5% in the late 1980s to 16.5% at its highest (or to 22.5% if those who participated in different employment activities were included). When the recession took place in the 1990s, many of the participants were still studying and had not transited from school to work, although those who completed a lower level of education were starting to transit into the labour market.

When the study cohort had reached their 40s the global financial crises took place in 2008, which slowed down or stopped economic growth for the next years. However, in Finland, the recession in the 1990s had a substantially more severe impact, for example, on unemployment rates (over 16% in 1994 vs. over 8% in 2010) (Statistics Finland 2016b). In the 1980s unemployment was rare, but after the 1990s recession the unemployment rate never decreased to pre-recession levels. Especially unemployment among young people and the long-term unemployment rose sharply (Kiander 2001). These times of economic crises have presented many challenges to the welfare state. Income differences have increased substantially from the mid-1990s to mid-2000s, but decreased from 2008 onwards (Vaalavuo and Moisio 2014). Despite these downturns in the development of welfare, a massive expansion in education has continued during the lives of this welfare generation. In the beginning of the 1980s over 50% of the population had no more than a basic education, in 2012 the amount had decreased to less than 20% (Kalenius 2014).

The global financial crisis is an example of globalisation that has had a growing impact on the study cohort. Compared to other Western Europe countries, Finland is at the moment rather average regarding mental health/depression and little over average regarding education and employment (Eurostat 2016a; Eurostat 2016b; Paykel, Brugha,

and Fryers 2005). However, suicide and alcohol-related death rates are above the European average in Finland (Ostamo and Lönnqvist 2004; Ramstedt 2002).

While several changes in the frequency of different disadvantages have emerged during the follow-up period of this study, no significant changes in mental health disorders have emerged, although depressive disorders have been suggested to increase between 2000 and 2011 (Markkula et al. 2015). Use of antidepressants has also increased (Markkula et al. 2015) and suicide mortality has decreased (Salokangas et al. 2012).

Alcohol consumption increased dramatically at the end of the 1960s and in the beginning of the 1970s, when the participants were children. Thereafter, the consumption stabilised for a decade and started to increase again at the end of the 1980s, when the individuals of this study cohort were in their twenties. During the 1990s recession, consumption declined, but after the recession, consumption has again increased up to 2005. Thereafter consumption started to decrease gradually, though still over 10 litres of pure alcohol per person (Karlsson and Österberg 2010). From the 1960s the frequency of heavy drinking has increased in women aged 15–69 and in men in younger than 30 years (Mäkelä, Mustonen, and Huhtanen 2010).

The service sector has been developed as part of the economic growth, although many cuts were made during the recession in the 1990s. Mental health services have increased and become more versatile. The main focus has changed from inpatient care to outpatient care. Although not all persons with mental health problems are still reached by the services, persons in need of services have been identified more thoroughly than before (Wahlbeck 2007).

This study is originally set in Tampere, an industrial and university city situated in southern Finland. Tampere is a fairly big Finnish city that had 167 000 inhabitants at the beginning of the 1980s. The last time the participants were contacted, 67% of those whose address was available lived in the Tampere region. Regional differences in welfare and disadvantage are evident (Karvonen 1995; Karvonen and Rimpelä 1996; Karvonen and Rimpelä 1997; Karvonen and Kauppinen 2008), so it should be acknowledged that this cohort consisted of adolescents living in an urban area, although they might have lived in other environments before and after adolescence.

4.2 The aims of the study

The main objective of this study is to examine disadvantage and its accumulation through the life course, covering the life phases of adolescence, early adulthood and midlife. This study uses a multidimensional perspective of disadvantage covering dimensions of health, social relations, socioeconomic factors, and risky behaviour. The following perspectives and life-course models will be examined: the clustered accumulation of disadvantage, a chain-of-risk model, and the longitudinal accumulation of disadvantage (trajectory model) among men and women.

Our specific study questions were in part empirically driven. First the aim was to map which different forms of disadvantage are most relevant for an extreme end point of disadvantage. The following aims focus on dimensions of social relations and risky behaviour, since they emerged as important dimensions regarding the first aim (in addition

to socioeconomic disadvantage) and are the two dimensions that have not been the focus of accumulated disadvantage theories and studies.

The specific study questions of this study are:

1. How does adolescent disadvantage determine mortality, which can be seen as an extreme end point of accumulation of disadvantage? The determinants are investigated as independent and clustered in different dimensions of disadvantage in adolescence. (Substudy I) (independent risk model and clustered accumulation model) (Fig. 2)

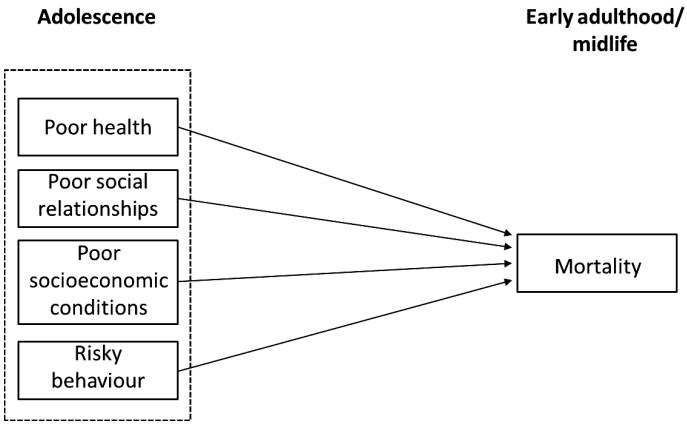


Figure 2 Clustered accumulation of disadvantage model (independent and clustered risks)

2. Are poor adolescent family relationships associated with midlife economic adversity (Substudy II) and psychological distress (Substudy III)? Are these associations shaped by disadvantage in early adulthood? (chain-of-risk model) (Fig. 3)

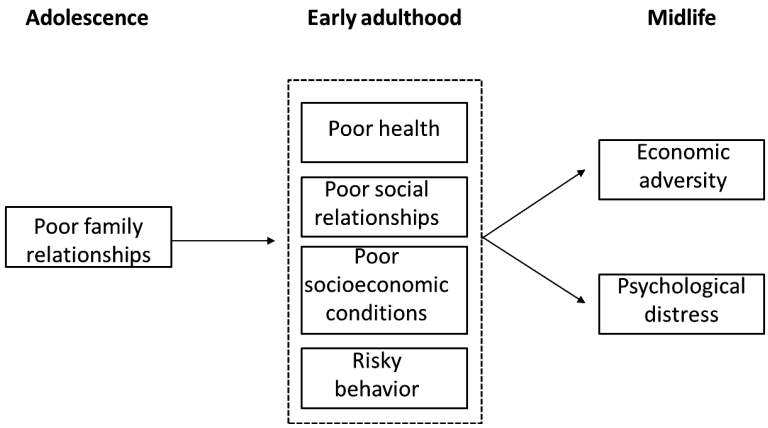


Figure 3 Chain-of-risk model (path model)

3. Are trajectories of heavy drinking associated with disadvantage in midlife? (Substudy IV) (a trajectory model, multiple exposures to the same risk factor) (Fig. 4)

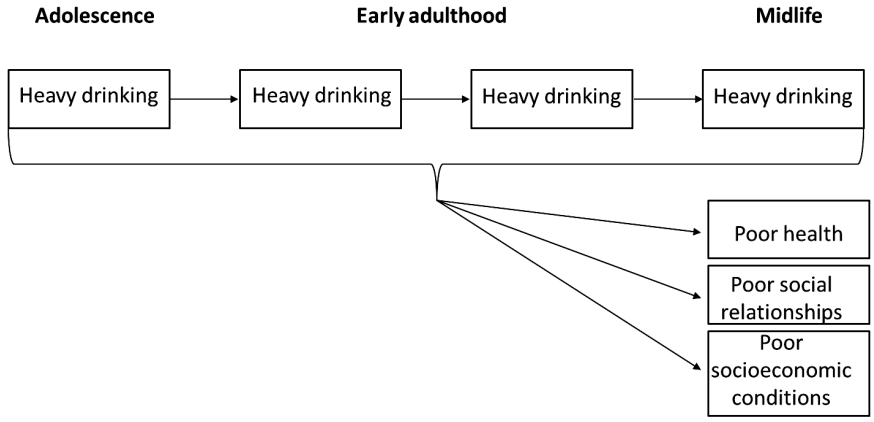


Figure 4 A trajectory model (Cumulative model)

5 Data and methods

5.1 Participants

The data for this study were collected as part of the Stress, Development and Mental Health Study (TAM-project) (Mustonen et al. 2013) and from the cause of death statistics compiled by Statistics Finland. The original study population included all Finnish-speaking 9th grade pupils attending comprehensive school in 1983 in Tampere. Adolescents not attending normal school due to severe handicap or illness were excluded as well as one class of pupils with intellectual or learning disabilities and one class of Swedish speaking pupils. Most of the pupils were born in 1967. In the first phase of the follow-up study, in 1983, 2194 pupils (96.7 %) with a mean age of 15.9 years (SD 0.3 years) completed questionnaires in classrooms during school hours. A research worker informed the students about the study and was available for any questions about it. Pupils who were absent on the day received the questionnaire later, filled it in at home and returned it by mail (less than 5% of the questionnaires). The participants were followed up using postal questionnaires in the years 1989, 1999 and 2009, at the respective ages of 22 (n=1656, 75.5%), 32 (n=1471, 67.0%) and 42 (n=1334, 60.8%) years (Fig. 5).

Most of pupils of the original follow-up study population (n=2076/2194, 94.6%) also participated at age 14 in a brief cross-sectional school survey that included all 8th grade school children in Tampere in 1981 (Aro 1988). Some of these data were also used in this study (studies II and III) (Table 1). In substudy I the mortality data between years 1983-2010 from the cause of death statistics were linked to the data.

In substudy I the data comprised all those who participated at age 16 (N=2194). In Studies II-IV only participants who had participated at least at age 42 were included in the analyses (n=1334), while of those, 86.6% had also participated at age 22 (n=1155) and 84.2% at age 32 (n=1123).

Comparison of the participants at the follow-up that age 42 with the non-participants showed that, based on the information gathered at age 16, the non-participants were more often men (60.8 vs. 45.0%, $p<0.001$), they drank alcohol (9.4% vs. 6.2%, $p=0.005$) and were drunk (28.2% vs. 23.5%, $p=0.024$) more often, they had poorer school grades (7.3 vs. 7.7, $p<0.001$) and were more often daily smokers (26% vs. 20%, $p<0.001$) than the participants at age 16. However, when all these factors were examined simultaneously, only male gender and poor school performance predicted non-participation (see also Eerola, Huurre, and Aro 2005). There were no differences between the groups in family structure at age 14 or self-perceived health, psychological, depressive or somatic symptoms, confiding support, problems in family relationships, parental SEP, or parental employment status at age 16.

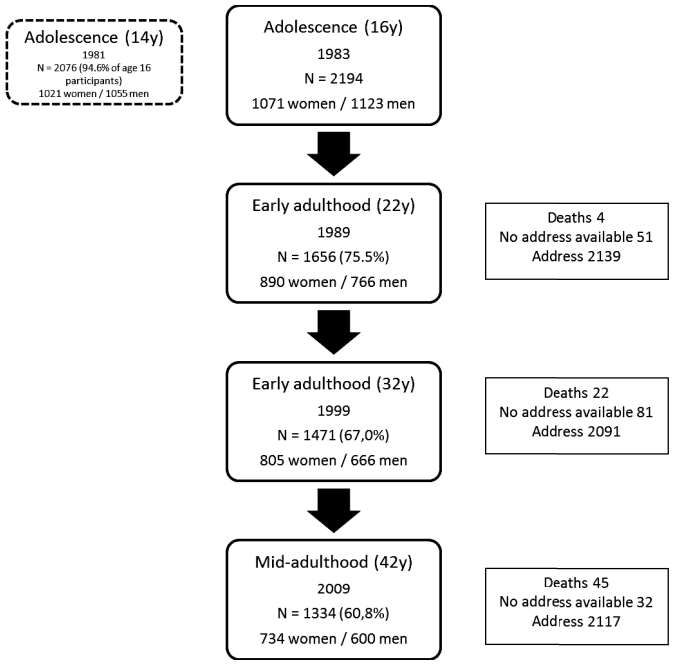


Figure 5 Recruitment process and participation in the Stress, Development and Mental Health study.

5.2 Study variables and their definitions

Table 1 summarises the variables used in this study. All variables, except mortality, are self-reported. The description of study variables (below) includes information only on the variables used in this particular study, even though many of them have been measured also in other study phases.

5.2.1 Health

Self-perceived health was studied at ages 16 and 42 years by a question 'What do you think about your health? Is it…?'. It was assessed on a 5-point scale ranging from very good to very poor, while the participants reporting the three poorest levels (average/rather poor/very poor) of health were classified as having *poor self-rated health*.

Chronic illness was examined at age 16 by asking whether the participant had any of seven common chronic illnesses, namely asthma, allergic rhinitis, other allergies, allergic skin conditions, other skin conditions, migraine or diabetes mellitus. Information on any other illnesses was collected with an open-ended question. Participants were classified into those having vs. not having a chronic illness.

Psychological and somatic symptoms were measured using a psychosomatic symptoms scale, which is a combined checklist of 17 psychosomatic symptoms (Aro 1981; Rimpelä, Rimpelä, and Pasanen 1982). The *psychological symptoms* scale covered five complaints: lack of energy or depression, anxiety or nervousness, fatigue or feebleness, irritability or fits of anger, and nightmares, while the *somatic symptoms* scale covered twelve complaints: abdominal pains, headache, difficulties in falling asleep or awakening during the night, loss of appetite, diarrhoea or irregular bowel function, tremor of hands, nausea or vomiting, heartburn or acid troubles, excessive perspiration without physical effort, palpitations, breathlessness and dizziness. In this study, psychological and somatic symptoms were studied at ages 16–32. The respondents reported whether and how often they had had symptoms during the past six months (excluding symptoms related to menstruation or hangover). The following ratings for each item were used to construct sum scores: 0=never, 1=sometimes, 2=quite often, 3=often or continuously. In substudy I both of these sum scores were dichotomised from the upper quartile to indicate existence of often occurring or many symptoms (no/yes). In substudies II-III the scales used were continuous.

Psychological distress was assessed at age 42 with the Kessler Psychological Distress Scale (K10) (Kessler et al. 2002). K10 is a ten-item questionnaire for the global measuring of distress based on questions about anxiety and depressive symptoms that a person has experienced in the most recent four-week period. The theoretical range of the scale is 5–50.

Depression was measured at ages 22, 32 and 42 using a Finnish version (Kaltiala-Heino et al. 1999; Raitasalo 2007) of the short 13-item Beck Depression Inventory (S-BDI (Beck and Beck 1972)). This Finnish version (R-BDI) includes introductory questions and an additional positive choice of answer for each item (e.g. I am feeling quite optimistic and good), the latter was scored as 0, thus it did not affect the scoring of depression. The sum score range for depressive symptoms is 0–39, and an R-BDI score of five or more was classified as depressed (Beck and Beck 1972). The scale was dichotomised in substudy IV and used as continuous in substudy II.

As R-BDI was measured only at age 22 and onwards, the measurement of *depressive symptoms* at age 16 was based on the psychosomatic symptoms scale, which included seven items indicative of depression: lack of energy or depression, sleeping difficulties, nightmares, fatigue, irritability, loss of appetite and, anxiety or nervousness. Four of them are used as symptoms of clinical depression (Pelkonen, Marttunen, and Aro 2003).

Mortality

Statistics Finland provided data on the deaths of the study participants. For the purpose of this study information gathered in the survey at age 16 was linked to the causes of death statistics using a unique personal identity number. Nine participants had an incomplete identity number or it was missing, so information was not available for them. Statistics Finland classifies causes of death based on the World Health Organization's International Statistical Classification of Diseases and Related Health Problems (ICD). ICD-8 was used

in the years 1983–1986, ICD-9 in the years 1987–1995 and ICD-10 from 1996. Changes in the classification system have not changed their comparability. Based on death certificates, causes of deaths were divided into: diseases, accidents, suicides, homicides, unclear and missing data. In addition, the causes of deaths were classified based on whether substance use was related to the death (as a main cause of death, contributory cause of death or otherwise mentioned in the death certificate as a factor related to the death).

5.2.2 Social relations

Family structure at age 14 was based on a question 'Does your household include…?' with five alternatives: 1) mother and father, 2) mother and a step-father, 3) father and a step-mother, 4) only mother or father, 5) some other guardian. Two dichotomous variables indicating *reconstituted family* (no/yes) and *single-parenthood* (no/yes) were formed.

Information about *parental death* and *parental divorce* was obtained at age 16 from answers to two structured questions: 'Are your parents alive' (1) yes both, 2) only mother, 3) only father, 4) neither one of them and 'Are your parents divorced?' (Yes/no).

Scales of *relationship with mother and father* were measured at age 16 and consisted of three statements: I feel my mother/father is close to me', I feel like my mother/father understands me', and 'I often argue with my mother/father'. Each statement was reported on a 5-point scale (I totally disagree…I totally agree) and positive statements were reverse coded, resulting in higher scores indicating a poorer relationship. The theoretical ranges of the sum scales for relationships with mother/father were 3–15. In substudy I only the first statement regarding closeness to a parent was used as an indicator of the quality of the relationship and the two negative choices were coded as poor relationship. *Home atmosphere* was measured at age 16 on a similar 5-point scale as statements about parental relationships.

Parental support in individuation at age 16 was comprised of six statements: 'Usually my parents trust me', 'My parents let me make my own decisions', I feel that my parents wish I succeeded better in my academic tasks', 'I often feel that I am different from my parent's wishes', 'I have friends that my parents don't approve of', and 'My parents are not interested in my opinions'. Each statement was reported on a 5-point scale (reverse coded if necessary) and the theoretical range of the sum scale for parental trust was 6–30, with higher scores indicating problems in trust.

Confiding support was measured at age 16 with a question: 'If you have a big personal problem, do you tell anyone about your difficulties? There were six response options: 1) I don't want to tell anyone, 2) I don't have anybody to tell, 3) Mainly I tell to my peers or siblings, 4) Mainly I tell to my parents, 5) Some things I tell to my parents and some to peers, and 6) other, what… The participants were classified into those who reported having support and to those who *lacked confiding support* i.e. those who did not have anyone to tell about difficulties or did not want to tell to anyone.

Information on *marital status* was collected at ages 32–42 with five response options: single, married, cohabiting, widow, and divorced or separated. Participants were classified as married or cohabiting and others.

At age 22 only a few were married and therefore the existence of an *intimate relationship* was measured by dividing the participants into those who were married, cohabiting or dating and others.

The *loneliness* scale was measured at age 42 and comprised five statements scored on a five-point scale. Statements were 'There are people close to me who support me', 'I feel lonely', 'I feel like it is easier for other people to make friends', 'I have no-one to turn to if necessary', 'There are people close to me with whom I can share joys and sorrows'. Statements were reverse coded if necessary and the theoretical range of the sum scale for loneliness was 5–25, with higher scores indicating loneliness. The participants were classified into two groups based on upper quartile: lonely and not lonely.

5.2.3 Socioeconomic factors

School achievement at age 16 was measured by asking the participants to report the mean of all school grades in the last school report (range 4-10). The participants were classified into good (mean $\geq$7) and poor (mean <7) grades.

At age 16 the participants were also asked about their *educational plans after compulsory schooling* with a question 'Are you planning on continuing studying after compulsory school?' and the response options were: 1) yes, in vocational school or through an apprenticeship, 2) yes, in upper secondary school, 3) yes, in some other school or institute, 4) I won't continue my education, and 5) I don't know'. The participants were classified into those having educational plans (options 1–3) and those not having plans (options 4–5).

SEP at age 16 was determined primarily based on father's occupation and if missing the mother's occupation was used. It was assessed with a question: 'What is your father's or stepfather's profession or job? Please describe the profession or job in as much detail as possible e.g. mechanic, principal, student.' If both of the parents' occupation was unknown, the SEP was based on the parent's education. The participants were grouped based on a standard classification of occupations into two classes (version 1): manual and others, or into three classes (version 2): upper non-manual, lower non-manual and manual (Statistics Finland, 1975).

Information on *parental unemployment* at age 16 was gathered separately for mothers and fathers with a question: 'What is your father's/mother's current employment status?'. The response options were 1) working outside home, 2) working at home (or a housewife), 3) unemployed, 4) retired, 5) on a long-term sick leave, and 6) other. The participants were classified into those having at least one parent unemployed or on a long-term sick leave and others.

Education was measured at ages 22–32. In substudy II education at age 22 was measured as basic education with a question: 'What is your basic education?'. The subjects were divided into those who had received only comprehensive school education

and to those who had completed general upper secondary school. At age 32 professional education was based on the question: 'What kind of professional education do you have?'. The subjects were divided into 1) those who had completed studies at a university, polytechnic or equivalent institution, 2) those who had a short-cycle tertiary education, 3) those who had studied at vocational schools, had completed vocational courses or apprenticeships and to 4) those who had received no education after compulsory education (OECD, European Union, and UNESCO-UIS 2015). In substudy III at age 22, the subjects were divided into those who only had a basic education (or at most a short sporadic occupational course) and those who were secondary school graduates or had taken vocational education.

Employment status was measured at ages 32 and 42. The subjects were asked about their employment status with the question: 'What is your current employment status?' The response options at age 32 were 1) employed, 2) unemployed or temporarily laid-off, 3) on a disability pension or a long sick leave, 4) on a maternity leave or on a unpaid maternity leave, 5) taking care of own home (housewife or house husband), 6) student, and 7) other. At age 42 the response options were the same as at age 32 except option 2 was divided into two options (unemployed with earnings-related unemployment allowance and to unemployed with basic unemployment allowance) and an additional option of part-time work was added. The participants were divided into 1) unemployed, temporarily laid off (full-time/part-time), on a disability pension (full-time/part-time) or on an extended sick leave and 2) those who were not included in the previous categories.

Income was assessed at age 42 by the question: 'In which of these income brackets does your household belong? Estimate all of your household income during a typical month, excluding taxes and including welfare benefits.' The response options varied from below EUR 1000 to more than EUR 7000 on a 7-point scale. Regarding household income, household composition was taken into account using weights of the modified Organization for Economic Co-operation and Development (OECD) equivalence scale: the respondent corresponded to one unit, other adults 0.5 units each and children 0.3 units each (Hagenaars, De Vos, and Asghar Zaidi 1994).

Information on economic situation was also assessed with *ability to cover expenses with income*. The participants were asked to assess 'When all of your household income is taken into account how easy/difficult it is to cover expenses with this income?' Response options were 1) very easy, 2) easy, 3) somewhat easy, 4) somewhat difficult, 5) difficult, and 6) very difficult. In version 1 (substudy II) the measure was used as described, in version 2 (substudy IV) the participants were divided into those finding it easy to cover expenses with income and to those who had difficulties.

The participants also assessed their current *subsistence* at age 42. They answered at question 'How do you see your household's current subsistence?' Response options were 1) very good, 2) fairly good, 3) average, 4) fairly poor, and 5) very poor.

Information on *home ownership* at age 42 was drawn from a question 'What kind of place do you live in?' and response options were 1) owner-occupied flat/house, 2) right of residence apartments or part-ownership dwelling, 3) rented flat, and 4) other. The participants were classified based on their home-ownership status into owners and renters/others.

5.2.4 Risky behaviour

Frequency of alcohol use was examined at age 16 (substudy I) and *heavy drinking* at ages 16–42 (substudies II-IV). Alcohol use at age 16 was assessed with the question 'Which of the following alternatives best describes your current alcohol use? Take into consideration also times when you had only very small amounts of alcohol.' The alternatives were 1) at least once a week, 2) about a couple of times a month, 3) about once a month, 4) about once every couple of months, 5) a few times a year, 6) once a year or less, and 7) I don't use alcohol beverages at all. The participants were classified based on the frequency of alcohol use into those drinking once a week and to those drinking less than that or not at all. Heavy drinking was assessed with two perspectives. In substudy IV heavy drinking was defined as frequency of heavy episodic drinking (version 2), and in substudies II-III also the alcohol-related harms were included in the measures (version 1). At age 16 heavy drinking was assessed with the question 'During the ongoing spring semester, have you used alcohol so that you have been drunk? (No vs. Yes, and how many times…?). In substudy IV the participants were classified into three categories: 1) frequent, if the participant reported being drunk at least four times during the spring term (on average once a month), 2) infrequent, if heavy drinking occurred 1–3 times, and 3) no heavy drinking. At age 22 participants were defined as frequent heavy drinkers if they reported heavy drunkenness at least once a month (or mild drunkenness at least weekly (in substudy IV)), infrequent heavy drinkers if they reported heavy drunkenness less often than once a month and to those not drinking heavily. At ages 32 and 42 alcohol use and heavy drinking were assessed with the Alcohol use disorders identification test (AUDIT) (Babor et al. 2001). In substudies II and III (version 1) heavy drinking was assessed using the complete AUDIT-test. In substudy IV (version 2) heavy drinking was assessed with a single question 'How often do you have six or more drinks on one occasion?' Frequent heavy drinking was defined as having six or more drinks in a session at least once a month, infrequent heavy drinking as drinking the amount less often than once a month and also the no heavy drinking category was established (substudy IV).

Information on *smoking* was assessed at age 16. The participants were asked 'Which of the following alternatives best describes your current smoking?'. The response options were 1) I smoke once a day or more often, 2) I smoke once a week or more often, but not daily, 3) I smoke less than once a week, 4) I have quit smoking, and 5) I don't smoke. The respondents were classified into daily smokers and others.

Having *problems with the law* was measured at age 16 by asking the respondents to report whether they had broken the law with consequences within the last 12 months (yes/no).

Table 1 Study variables used in the original studies (I-IV) at age 14, 16, 22, 32, and 42

Disadvantage variable	Age	Substudy
Health		
Poor self-rated health	16	I, IV
	42	IV
Chronic illness	16	I
Psychological symptoms	16	I, III
Somatic symptoms	16	I, II
	22, 32	II, III
Psychological distress	42	III
Depression	22, 32	II
	42	IV
Depressive symptoms	16	II, IV
Social relations		
Single-parent family	14	II, III
Reconstituted family	14	II, III
Parental death	16	I
Parental divorce	16	I
Not close with father	16	I
Not close with mother	16	I
Poor relationship with father	16	II-IV
Poor relationship with mother	16	II-IV
Poor home atmosphere	16	II, III
Lack of parental support in individuation	16	II, III
Lack of confiding support	16	I, IV
Not in a relationship	22	II, III
Single, divorced, widow	32	II, III
	42	IV
Loneliness	42	IV
Socioeconomic factors		
Poor school achievement	16	I, II, IV
Lack of educational plans	16	I
Low parental SEP (version 1)¤	16	I
Low parental SEP (version 2)¤¤	16	II, IV
Parental unemployment	16	I, IV
Low basic education	22	II
No secondary/vocational degree	22	III
Low education	32	II
Unemployment	32	III
	42	IV
Low income	42	II
Inability to cover expenses (version 1)+	42	II

Table 1 continued

Inability to cover expenses (version 2)++	42	IV
Poor subsistence	42	II
Not owning a house (renter etc.)	42	IV
Risky behaviour		
Frequent alcohol use	16	I
Frequent heavy drinking	16	IV
(version 1)*	22	II-III
(version 2)**	22	IV
(version 1)*	32	II-III
(version 2)**	32	IV
	42	IV
Daily smoking	16	I
Law breaking	16	I
Mortality	16-43	I

¤ Parental SEP dichotomized (manual vs. other)

¤¤ Parental SEP 3 classes (manual, lower non-manual, upper non-manual)

+ Variable measured on a 6-point scale

++ Dichotomous variable (easy vs. difficult to cover expenses with income)

* Frequency of drinking, frequency of heavy episodic drinking, harms related to alcohol use

** Frequency of heavy episodic drinking

5.3 Statistical methods

For descriptive statistics means, standard deviations and frequencies of the study variables were reported. Differences between groups were tested using Chi square (χ^2) –test or Fisher's exact test and in non-normal distributions with the Kruskal-Wallis and Mann-Whitney U tests. A probability level of $p<0.05$ was chosen to indicate statistical significance. In some cases also p-values <0.10 were reported.

For Cox proportional hazards models and logistic regression models the results are presented in terms of hazard ratios (HR) and odds ratios (OR) respectively, with 95% confidence intervals (95% CI).

The structural equation modelling (SEM) approach was used in substudies II-IV. To analyse model fit, the comparative fit index (CFI), the Tucker-Lewis index (TLI) and the root-mean-square error of approximation (RMSEA) were selected with reference to standards provided by Hu & Bentler (1999). The full information maximum likelihood (FIML) estimation method was used to deal with missing values due to attrition (in panels at ages 22 and 32). Bootstrapping was used to calculate the 95% CIs (in substudies II and III).

All analyses were principally performed separately for men and women (Substudies I-IV), with few exceptions. In substudy I the analyses are presented together for women and

men, because of the small number of deaths. Further, the heavy drinking trajectory groups were analysed together. In both cases, replicative analyses were performed to check possible differences. In substudies II and III the models were analysed using the multi-group option in order to obtain separate parameter estimates for women and men while keeping the measurement model as invariant as possible between genders.

All analyses were performed using PASW Statistics version 18 (SPSS Inc. 2009), IBM SPSS Statistics versions 21 and 22 (IBM Corp. 2013) and MPlus versions 5.1 and 7 (Muthén and Muthén 1998-2015).

Statistical methods in substudy I

In substudy I associations between disadvantage at age 16 and mortality were assessed with comparisons between those who had died and those who were still living at the end of the follow-up. Cox proportional hazards models were used to examine the effect of disadvantage at age 16 on mortality, when controlling for gender. Different forms of disadvantage were first studied as separate variables and then by constructing scales of cumulative disadvantage on five different dimensions of life (Table 2). Analyses with separate variables and dimensions of disadvantage were both performed first as univariate and then as multivariate models. Also, the interactions between these five dimensions of disadvantage were examined. Finally, after examining separate forms and dimensions of disadvantage, the total accumulation of disadvantage was examined by constructing a scale measuring the number of dimensions that indicated disadvantage within a person.

Statistical methods in substudies II and III

The measures of family relationships (in substudies II and III) and economic adversity (in substudy II) were specified as latent constructs (Table 2). Pathways from family relationships to age 42 outcomes were analysed by examining the total, indirect, total indirect and direct effects using path analyses in the SEM framework. The robustness of these paths was examined by controlling for family structure, parental SEP (Substudy II-III) and adolescent mental health (Substudy III) and corresponding age-16 variables (indirect effect via depression adjusted for depression at age 16 etc.). The model indirect option with the theta method and weighted least square parameter estimator (WLSMV) was used to test the indirect effects. Gender differences were tested by constraining examined paths to be equal for both genders and by observing significant differences in model fit, according to procedures presented in an article by Lau & Cheung (2012).

Statistical methods in substudy IV

In substudy IV pathways of heavy drinking were examined as trajectories extracted using growth mixture modelling. The overall shape of the heavy drinking trajectory was studied with latent growth curve analysis. Latent class growth analysis (LCGA) (Muthen and Muthen 2000; Nagin 1999) was used to identify trajectory classes. Bayesian information criterion (BIC) and the bootstrapped parametric likelihood ratio test (BLRT) were used to help to determine the optimal number of classes. The associations between heavy drinking trajectory groups and disadvantage at age 42 were examined with logistic regression analyses.

Table 2 Summary of variables used in dimensions of disadvantage

Dimension	Variables	Substudy
Health*		I
	Somatic symptoms	
	Psychological symptoms	
	Poor self-rated health	
	Chronic illness	
Social relations*		I
	Parental divorce	
	Parental death	
	Not close with mother	
	Not close with father	
	Lack of confiding support	
Risky behaviour*		I
	Frequent alcohol use	
	Daily smoking	
	Law breaking	
Education*		I
	Poor school achievement	
	Lack of educational plans	
Socioeconomic*		
	Low parental SEP (version 1)	
	Parental unemployment	
Family relationships (a latent construct)		II-III
	Poor relationship with father	
	Poor relationship with mother	
	Poor home atmosphere	
	Lack of parental support in individuation	
Economic adversity (a latent construct)		II
	Low income	
	Inability to cover expenses (version 1)	
	Poor subsistence	

*For gender difference and Cox proportional hazards analyses the sum scores were dichotomised using the upper quartile as a cut off.

5.4 Ethical considerations

The study protocol was approved by the Ethics Committee of the National Institute for Health and Welfare (formerly the National Public Health Institute) and the Ethics Committee of Tampere University Hospital. Statistics Finland approved the use of mortality data.

The National Advisory Board on Research Integrity has set ethical principles for research, which are divided into three areas: 1. Respecting the autonomy of research subjects, 2. Avoiding harm and 3. Privacy and data protection (National Advisory Board on Research Ethics 2009).

The first ethical principle was put into action for example by ensuring that participation in this study was voluntary and based on informed consent. In 1983 a research worker introduced the purpose of the study to the pupils at age 16 and was available for questions about the research. In later study phases in 1989, 1999, and 2009 the information was provided to the study subjects in writing and research workers were available to answer any further questions about the study by telephone, email, or mail. The participants have had the chance to withdraw from the study at any point.

The second ethical principle concerning avoiding harm can be explored from three different perspectives: mental, social, and financial harm. Some of topics in the questionnaires might have brought out mental strain for some of the participants (e.g. questions about childhood family adversities), but these topics can come out in everyday life situations as well and normally they do not cause adult subjects excessive stress. Social and financial harm for participants has been avoided by considering privacy and data protection issues carefully.

The third ethical principle about privacy and data protection falls into three categories: 1. protecting research data and confidentiality, 2. storing or disposing of research data and 3. research publications. All personal identification codes have been deleted in the data, thus individual participants cannot be identified by the researchers analysing the data. However, since identification is necessary for follow-up purposes, a small number of authorized personnel have access to the identification numbers for this specified purpose. Institutional guidelines of THL have been followed regarding information security, including handling and storing data.

6 Results

6.1 Characteristics of the participants, prevalences and gender differences of disadvantages

Means, distributions and gender differences of the study variables are reported in Appendix Table 1. Already at age 16 girls and boys differed in many ways in the frequency of different disadvantages. Women reported more health problems at all ages, except there was no gender difference in poor self-perceived health at age 16, while at age 42 men perceived their health poorer than women. Men had higher mortality rates compared to women and alcohol use was associated with the cause of death more often in men.

Regarding social relationships, girls reported poorer relationships with the father and they experienced the home atmosphere to be poorer than boys. At age 22 men reported more often not being in a relationship than women, but by age 32 this gender difference levelled off. At age 42 men experienced more often feelings of loneliness than women.

There was no gender difference in the socioeconomic variables at age 16, although boys reported poorer school achievement than girls. At age 22, 14% of women and 10% of men had only basic education. Ten years later 7% of women and 10% of men had completed only lower secondary education. At age 42 women reported their household income to be lower than did men, although there was no gender difference in the amount of persons having difficulties in covering their expenses with income or perceiving their subsistence to be poor.

Heavy drinking was fairly common. In adolescence and early adulthood, almost every quarter and in adulthood every third drank heavily at least once a month. At age 16 there was no gender difference in heavy drinking, but after that, differences start to emerge so that men are heavy drinkers over twice as often as women. However, already at age 16 boys reported drinking alcohol more often than girls and they also reported more often daily smoking.

6.2 Independent and clustered risks of mortality (Substudy I)

By the year 2010, 35 (3.1%) men and 13 (1.2%) women had died. The most common causes of death in men were suicides (34%), diseases (26%) and accidents (20%) and in women diseases (46%), and equally accidents and suicides (23%). Based on death certificates, substance use was associated with death in over 50% of the cases.

In univariate analyses, several adolescent disadvantages (parental divorce, distant father relationship, frequent alcohol use, daily smoking, lack of educational plans and parental unemployment) were associated with mortality when adjusted for gender. In multivariate analyses lack of educational plans was most strongly associated with mortality.

The accumulation of disadvantage was first examined one dimension at a time. All the dimensions except health were associated with mortality (Table 3). In the multivariate analyses, the dimension of social relations was most strongly associated with mortality.

Finally, total accumulation of disadvantage was examined with a sum scale, which indicated the number of dimensions the disadvantage had extended to (Table 3). Those who had cumulative disadvantage in three or more dimensions were at increased risk of dying before age 43. The risk grew gradiently when the number of dimensions increased. These analyses were also repeated while excluding causes of diseases (except alcohol diseases). The results in these analyses did not differ considerably from the original results.

6.3 Pathways from adolescent family relationships to disadvantage (Substudies II and III)

First we examined the total effects of poor adolescent family relationships on midlife disadvantage. Problems in family relationships were associated with economic adversity and psychological distress at age 42 in men and women. However, after adjusting the psychological distress model for mental health at age 16, problematic family relationships were no longer associated with psychological distress in men (Table 4), although the gender difference was not significant.

Secondly, we added the age-22 and -32 disadvantages (10 variables/model) to the models and examined the associations between all the variables. Finally, we excluded those age-22 and -32 disadvantage variables that did not have a role in linking family relationships (16y) and outcome (42y) and we examined the indirect effects of these models. The results of these analyses are presented in the two following sections.

Finally, we examined the total indirect effects of the models. The total indirect effects were significant in all the models and in both genders, indicating that all these examined intermediate factors transmitted the association between poor adolescent family relationships and midlife economic adversity or psychological distress simultaneously (Table 4).

Table 3 Gender adjusted cox proportional hazards models for accumulation of disadvantage within different dimensions of disadvantage and across dimensions.

		Deaths	Alive		
	Number of disadvantages	n	n	HR	95% CI
Health	0-1	35	1617	1.00	
	2-4	13	519	1.28	(0.68-2.43)
Social relations	0-1	30	1691	1.00	
	2-5	18	445	2.26	(1.26-4.06)
Education	0	25	1485	1.00	
	1-2	23	651	1.78	(1.00-3.16)
Socioeconomic	0-1	43	1485	1.00	
	2	5	651	3.16	(1.25-7.99)
Risky behaviour	0	26	2059	1.00	
	1-3	22	77	2.26	(1.27-3.99)
	Number of dimensions of disadvantage				
	0	14	847	1.00	
	1	11	642	1.01	(0.46-2.23)
	2	7	413	0.97	(0.39-2.39)
	3	9	177	2.63	(1.13-6.10)
	4	6	55	6.10	(2.35-15.89)
	5	1	2	23.49	(3.08-178.96)

Table 4 Path analyses in the structural equation modelling from poor adolescent family relationships to economic adversity and psychological distress at age 42. Estimates and 95% confidence intervals (CI) for total and total indirect effects.

	Economic adversity[a]				Psychological distress[b]			
	Women		Men		Women		Men	
	Est.	95% CI	est.	95% CI	est.	95% CI	est.	95% CI
Total effects[c]								
Model 1[d]	0.170	(0.091-0.249)	0.193	(0.100-0.287)	0.187	(0.111-0.263)	0.125	(0.035-0.214)
Model 2[e]	0.134	(0.052-0.215)	0.183	(0.088-0.278)	0.109	(0.027-0.191)	0.047	(-0.054-0.148)
Total indirect effects[e, f]								
	0.193	(0.124-0.262)	0.140	(0.076-0.205)	0.061	(0.025-0.096)	0.072	(0.009-0.135)

a) A latent construct (low income, poor perceived subsistence, inability to cover expenses with income)

b) Kessler's psychological distress scale K10.

c) In the model: age 16 family relationships and age-42 outcome

d) No adjustments

e) Adjusted for family structure and parental SEP (economic outcome) (substudies II-III) and age 16 mental health (mental health outcome) (substudy III)

f) In the model: age 16 family relationships, age 22–32 forms of disadvantage that link pathways from age 16 to age 42 and the age-42 outcome

Pathways to economic adversity

The pathways from poor adolescent family relationships to economic adversity in midlife were examined via five different forms of disadvantage (somatic symptoms, depression, relationship/marital status, education, and heavy drinking). Each model consisted of both age-22 and age-32 disadvantages, while adolescent family structure and parental SEP were taken into account in the analyses. The problematic adolescent family relationships were associated with economic adversity at age 42 via depression (22y), education (22-32y) and also via education (22y) and, further, marital status (32y) for women (Fig. 6). For men the association transmitted via education (22-32y) (Fig. 7).

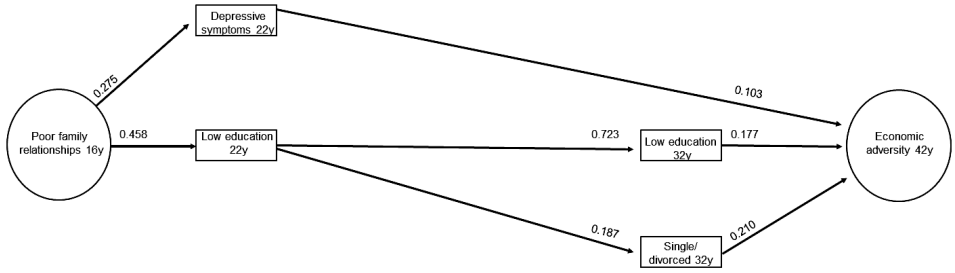


Figure 6 The significant (95% CI), standardized estimates of indirect paths from poor adolescent family relationships to mid-adult economic adversity in women derived from path analyses using structural equation modelling.

Figure 7 The significant (95% CI), standardized estimates of indirect paths from poor adolescent family relationships to mid-adult economic adversity in men derived from path analyses using structural equation modelling.

When these significant indirect paths were adjusted for age-16 depressive symptoms and the mean of school marks for women, the association via education (22y) and further to marital status (32y) was attenuated. When, in men, the model was adjusted for depressive symptoms, the mean of school marks and heavy drinking, the indirect path via education was attenuated.

Pathways to mental health

The pathways from adolescent family relationships to psychological distress in midlife were examined via somatic and psychological symptoms, relationship/marital status, low education/unemployment and heavy drinking. First, each model consisted of both age-22 and age-32 forms of disadvantage, while adolescent family structure, SEP and psychological symptoms were taken into account in the analyses. The problematic adolescent family relationships were associated with psychological distress at age 42 via psychological symptoms (22y, 22-32y) and heavy drinking (22y, 22-32y) for women and

via psychological symptoms (22y, 22-32y) for men (Fig. 8-9). When conducting an additional analyse for women and adjusting for heavy drinking at age 16, the pathway via heavy drinking remained.

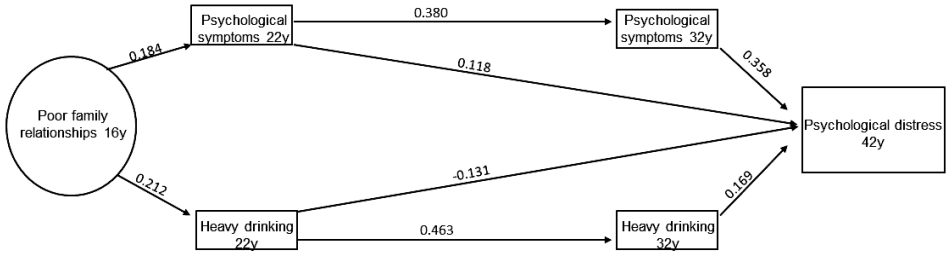


Figure 8 The significant (95% CI), standardized estimates of indirect paths from adolescent family relationships to mid-adult psychological distress in women derived from path analyses using structural equation modelling.

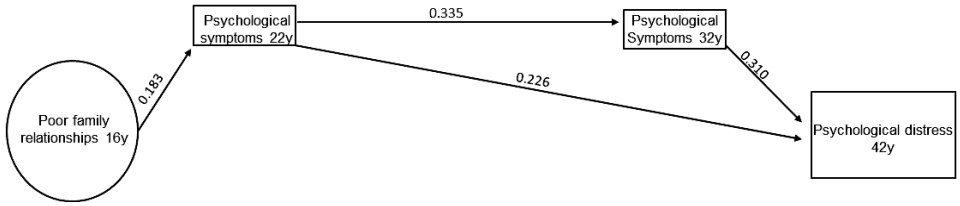


Figure 9 The significant (95% CI), standardized estimates of indirect paths from adolescent family relationships to mid-adult psychological distress in men derived from path analyses using structural equation modelling.

6.4 Trajectories of heavy drinking and midlife disadvantage (Substudy IV)

The development of heavy drinking and its association with midlife disadvantage was assessed in substudy IV. The five-class solution of LCGA was chosen as the most appropriate, based on fit indices, group sizes and interpretation (Fig. 10). The moderate trajectory group was the largest for both men (35%) and women (36%). Otherwise many gender differences appeared. The second largest group for women was the steady low trajectory group (32%) and for men the steady high group (32%). The smallest group for women was the increasing trajectory group (6%) and for men the decreasing group (6%).

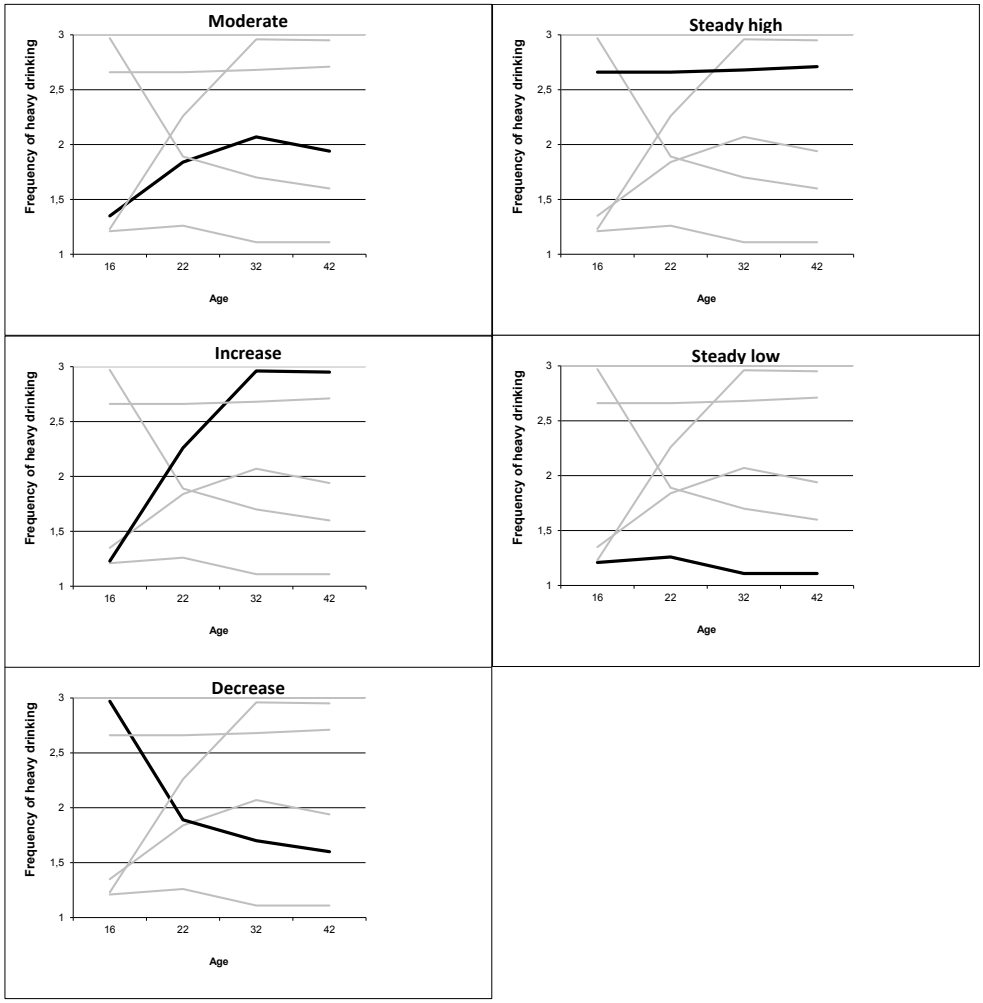
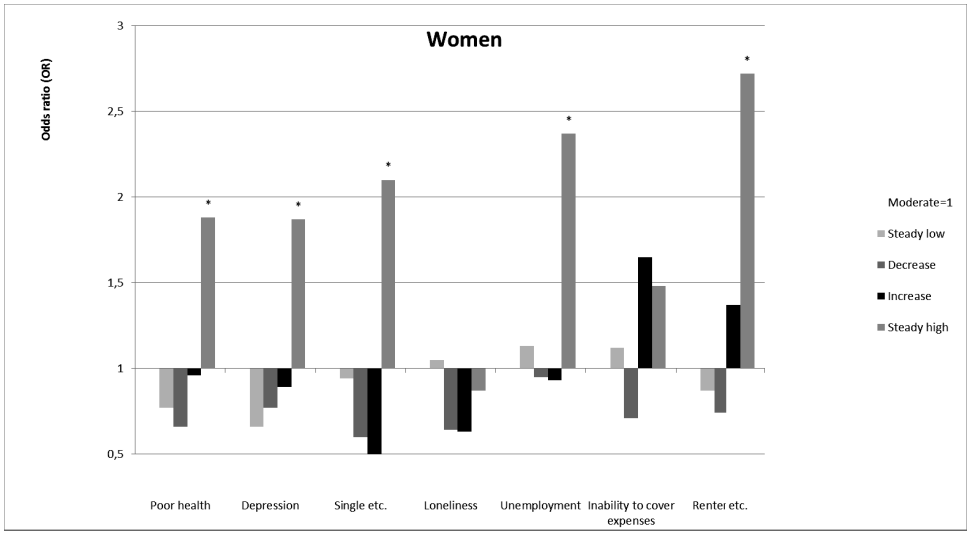


Figure 10 Illustrations of the development of frequency of heavy drinking from age 16 to age 42 assigned to the trajectory groups by latent class growth analyses

In women, a steady high heavy drinking trajectory was associated with all the measured forms of disadvantage at age 42, except with loneliness and difficulties to cover expenses with income. The ORs ranged from 1.87 to 2.72 in the adjusted model (Fig. 11). In men, the increasing trajectory was associated with poor health, depression, difficulties to cover expenses and not being a house owner, the ORs ranging from 1.77 to 2.46. A steady high trajectory was associated with economic disadvantages (ORs 1.76-2.18) in men. In addition, a steady low trajectory was associated with being single, divorced or widowed (Fig. 11).



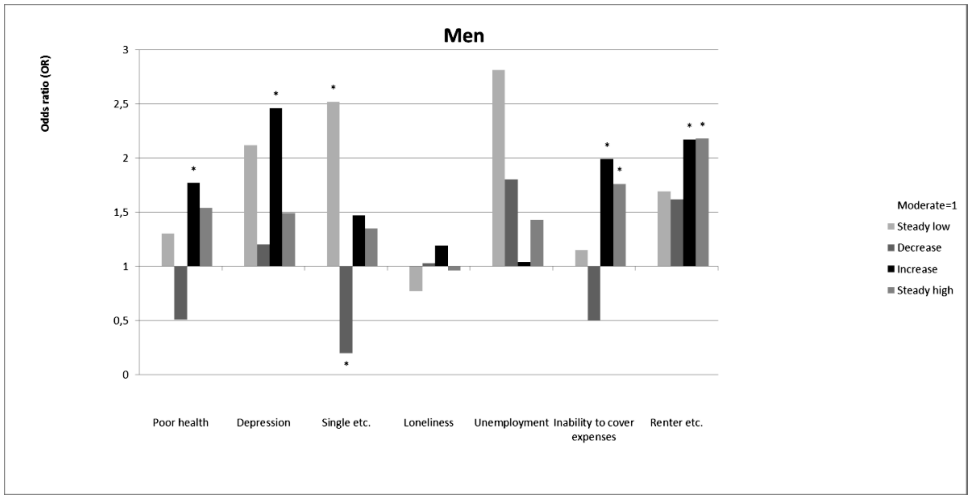


Figure 11 Odds ratios of disadvantage at age 42 by heavy drinking trajectory groups. The reference category is the moderate group. Adjusted for self-perceived health, depressive symptoms, social support, relationships with mother and father, mean of school grades, parental employment status and parental SEP at age 16. * Statistically significant within 95% CI.

7 Discussion

7.1 Summary of main findings and their discussion

The *first* main finding is that already in adolescence there are people with several different forms of disadvantage and these disadvantages extend to several dimensions of life. Lack of educational plans in adolescence was the strongest risk factor for mortality. However, only a few of these individual disadvantages are associated with mortality, when all other forms of disadvantage are taken into account. However, accumulation of disadvantage is associated with mortality in several different dimensions of life and the more widely the disadvantage has extended, the more severe is the risk of mortality.

The *second* main finding underlines that the association between poor family relationships and economic adversity in midlife is mainly shaped by low education and depression in early adulthood in women. In men, it seems that those with poor family relationships are already in adolescence on a path of disadvantage that will continue into adulthood regardless of whether they have problematic family relationships.

The *third* main finding highlights the role of mental health problems and in women also heavy drinking in early adulthood as the most important forms of disadvantage shaping the association between adolescent family relationships and midlife mental health problems. Adolescent family relationships are associated with disadvantage in later life phases, but whether the association can be traced all the way to midlife disadvantage is mainly determined by disadvantage in early adulthood

The *fourth* main finding suggests that frequent heavy episodic drinking continuing from adolescence to midlife is most detrimental for subsequent disadvantage in various dimensions of life. The positive finding is that frequent heavy drinking that is reduced after adolescence does not leave any permanent scars on the wellbeing of a person.

The results of this thesis suggest several different possibilities for the intertwining for adolescent, early adult, and midlife disadvantage. These possibilities include models of clustering, cumulation and chain of risks.

7.1.1 Accumulation of disadvantage in adolescence determining mortality

Many individual forms of adolescent disadvantage were associated with mortality, but when all these individual factors and gender were examined simultaneously, only the association between lack of educational plans or their uncertainty and mortality before midlife remained strong. The significant role of education has been found also in previous mortality studies (Mattila et al. 2005; Pensola and Valkonen 2002). Although the reason for this association is not explicit, often it is the education and work life that provide the best opportunities for an adolescent to integrate into society and if this integration does not take place properly, the adolescent is at risk for subsequent disadvantage that leads to more severe disadvantage pathways and in the worst case to death. Since most causes of deaths were external and not diseases, it is likely the factors related to personal

characteristics (e.g. cognitive or behavioural factors) play a more important role than the health status of a person.

Accumulation of disadvantage has usually been referred to as a temporal process, but some studies have examined the issue also as clustering of disadvantage in one point in time. In mortality research this approach has usually been conducted in studies on multiple behavioural risk factors for e.g. cardiovascular mortality (Raitakari et al. 1995), while not many mortality studies have examined the adolescent risk factors or disadvantages from a truly multidimensional approach.

When we examined dimensions of disadvantage individually, accumulation in all (social relations, socioeconomic factors, risky behaviour) but the health dimension was associated with mortality. Adolescence has been commonly viewed as a healthy life phase with less health inequality than in other life phases (Patton et al. 2009; West 1997). It is likely that a stronger impact of these other social and behavioural factors exceed the impact of health in adolescence. Previous studies have suggested inconsistent results regarding adolescent health and mortality. These inconsistencies might be due to differences in measuring health. Few studies have found an association between adolescent physical health and mortality (Elo and Preston 1992), but it is well documented that poor mental health is associated with suicides (Turecki and Brent 2016) and all-cause mortality (Lawrence, Kisely, and Pais 2010). In addition, these inconsistencies might be due to differences regarding causes of deaths; thus, a more detailed analyses of clustering of adolescent disadvantage and different causes of death is needed.

Clustering of risky behaviour in adolescence has been found to be associated with several adverse outcomes (Kipping et al. 2012) especially with injury-related deaths (Mattila et al. 2008). In this study substance use was a contributory cause of death in over half of the cases. Also, adolescent risky behaviour was associated with mortality, although factors related to education and social relationships played a more important role. It has been stated that clustering of risky behaviour increases with age, especially in adolescence and early adulthood (Spring, Moller, and Coons 2012) and this increasing clustering might compound the risk and be one pathway to mortality. It might also be that risky behaviour in adolescence is generally associated with weak control over one's life and this is more strongly reflected in educational forms of disadvantage in adolescence.

In a multivariate analysis, accumulation of disadvantage in the dimension of social relationships was most strongly associated with mortality. Social relationships have not been the focus in previous mortality studies, other than in relation to family structure and parental divorce. According to this study they should be part of the core focus when examining adolescent risk factors for mortality. Good social relationships can act as protective factors against various adversities in life and their lack can be a risk for subsequent disadvantages. A dysfunctional social environment in the family has been suggested to link to adult mortality via allostatic load, unhealthy behaviours, stress and coping mechanisms and lack of social support in adulthood (Holt-Lunstad, Smith, and Layton 2010; Kelly-Irving et al. 2013).

Our results suggest that about 9% of the adolescents experienced disadvantage that was extended widely (to 3 or more dimensions) and in addition, 19% were at risk for increased clustering (2 dimensions). Since the accumulation of disadvantage is a temporal

process and it is unlikely that these disadvantages have occurred overnight, the longitudinal mechanisms over the life course have influenced the entanglement of these disadvantages already for a long time.

Life-course models of critical periods, chains of risk, and accumulation have previously been used to link early life conditions and adult mortality (Ferraro and Shippee 2009; Hayward and Gorman 2004; Kuh et al. 2002; Montez and Hayward 2011). Early life factors can act as independent risks for mortality or the risks could interact at different stages of the life course (Kuh and Ben-Shlomo 2004a).

7.1.2 The role of family relationships in chains of disadvantage

In life-course research, parent–child relationships exemplify linked lives (Crosnoe and Benner 2016) indicating that individual life paths are shaped by interaction with others. According to this study, poor family relationships are associated with several disadvantages in early adulthood, which is in line with many previous studies (Caspi et al. 1998; Landstedt, Hammarström, and Winefield 2015; Merz and Jak 2013; Visser, de Winter, and Reijneveld 2012). This indicates that good quality family relationships and support from the parents have a role in building wellbeing in later life phases. Only a few studies have examined whether the association lasts all the way to midlife disadvantage (e.g. Landstedt, Hammarström, and Winefield 2015). In addition to that, it is difficult to compare our results with those of previous studies because of the diversity in defining and measuring family relationships and disadvantages. In time, support from friends and intimate partners usually replaces or at least supplements the childhood/adolescent family support, but we did find some longstanding associations between poor adolescent family relationships and midlife disadvantage.

Most previous studies examining the long-term effects of childhood family on adult socioeconomic disadvantage have focused on family structure (e.g. East, Jackson, and O'Brien 2006; McLanahan and Percheski 2008) and resources (e.g. Breen and Goldthorpe 2001; Corcoran 1995). We found that poor adolescent family relationships were associated with economic adversity in midlife over and above parental SEP and family structure. This association was shaped by early adult education and depression in women. In men, we did not find strong evidence to suggest the independent role of family relationships, when disadvantage already in adolescence was taken into account.

Previous studies have suggested several risk factors for poor mental health in adulthood (Colman et al. 2014; Fisher and Baum 2010; Räikkönen et al. 2012). We found poor family relationships to be associated with midlife psychological distress, and although after adjusting for mental health in adolescence, this was found only in women, the gender difference was not statistically significant. These gender differences are discussed in more detail in section 7.1.4.

As we expected, poor family relationships were associated with midlife disadvantage via early adulthood disadvantage (in women). These findings highlight the importance of examining interlinks and mechanisms between different life phases. Since we could not find any studies that have examined the association between adolescent family

relationships and midlife disadvantage as a chain of risk mediated by early adulthood, it is difficult to compare our results with previous studies. However previous studies support our findings that poor family relationships are associated with poor health, heavy alcohol use and low education in early adulthood (Caspi et al. 1998; Landstedt, Hammarström, and Winefield 2015; Merz and Jak 2013; Visser, de Winter, and Reijneveld 2012) and these disadvantages have been found to be associated with subsequent socioeconomic factors (Autor 2014; Virtanen, Janlert, and Hammarström 2013) as well as mental health (Boden and Fergusson 2011; Steptoe 2007; Strandh et al. 2014). Next, the intermediating role of these dimensions of disadvantage is discussed.

Health paths

Even though poor family relationships were associated with somatic symptoms in early adulthood, physical health did not have a role in mediating these pathways to economic or mental health disadvantage in midlife. This might be for several reasons. One issue that was already discussed to some extent regarding our findings on mortality is that the participants of this study were rather young (under 44 in the last follow-up). It might be that health-related factors do not emerge as significant in the pathways of disadvantage until later in life. Thus, it would be important to examine physical health as part of the pathways of disadvantage with even longer follow-up times expanding to late midlife and old age.

However, in this study, poor mental health in early adulthood mediated the pathways from poor adolescent family relationships to midlife psychological distress and in women also to economic adversity. In families with difficulties in interaction, parenthood might be characterised by more negative, unpredictable, and less supportive parental practices, which set a course to a stressful pathway. In addition to heritability, impaired parenting has been found to be one mechanism explaining a higher risk of mental health problems in children of parents with such disorders (Elgar et al. 2007). It might be that poor family relationships increase psychological distress in adolescence, which further continues to midlife. It might also be that a person's social competencies and skills are not developed in a positive way, because of poor family relationships and the lack of these social skills leads to complications in social relations, which further cause psychological distress. Poor mental health can also restrict a person's participation in everyday life (e.g. education, work) (Huurre et al. 2005) and this further limits opportunities to gain economic wellbeing.

Social relations

We did not find an intermediating path of social relationships from poor adolescent family relationships to midlife disadvantage, although previous studies have suggested these links (Fuhrer et al. 1999; Merz and Jak 2013; Smock 1993). It has been suggested that adolescents with problematic models for social interactions continue with these models into adulthood and might have a distorted perception of their social world later (Garber 2010). Even though marital status has been found to be associated with several forms of disadvantage, especially related to health (Sbarra 2015), it is not the best measure to describe the social support or lack of it. More precise measures would indicate quality of

marriage or support in an intimate relationship (Robles et al. 2014). We measured social relationships in early adulthood with relationship/marital status, which is likely too crude a measure to examine variation in social skills.

Socioeconomic factors

In a traditional sense, socioeconomic conditions are the core of disadvantage and have been widely studied (Davey Smith 2003). As expected the educational path in adolescence shaped the association between poor adolescent family relationship and midlife economic adversity. Previous studies have often found education to play an important role in shaping a person's wellbeing in adulthood. Many studies have found parental SEP to determine the offspring's future adult SEP and suggested that good quality family relationships can buffer against these adversities (Kim-Cohen et al. 2004). This study shows that in addition to family's socioeconomic conditions, family relationships also matter, at least in women. An adolescent's or young adult's educational attainment is often determined by e.g. parental educational aspirations and attitudes and these are more easily transmitted to children if the relationships between the parents and the children are good. Poor relationships between adolescent and the parents might compromise the parental support adolescents need in school, steering them to a poorer educational path.

Risky behaviour

In this study, poor adolescent family relationships were associated with heavy drinking in early adulthood and in women this pathway was traced all the way to psychological distress in midlife. Many risky behaviours are first tried in adolescence and this can be a common subject of conflicts in the family. Experimental alcohol use is common in adolescence and parents have an opportunity to deal with these conflicts constructively, so that these conflicts do not compromise the general quality of good adolescent–parent relationships.

It might be that poor family relationships are caused by a maladaptive trajectory in which the adolescent is already set. Thus, a firm conclusion about the direction of the associations cannot be drawn in this study. We took into account some factors that might affect family relationships (family structure, parental SEP, adolescent mental health, heavy drinking and school achievement). This procedure diminished the relevance of only some of these paths (to economic adversity in men), which highlights the importance of examining the bi-directionality regarding social relationships and disadvantage. The strongest evidence to suggest that family relationships are causally related to subsequent disadvantage is provided by genetically informed multilevel studies. For example these studies have found some features of parent–child relationships (e.g. parent-child conflicts or harsh punishment) to be associated with externalising symptoms (such as substance use and conduct problems) even when controlling for the adolescent's genetically influenced characteristics (Burt et al. 2006; Lynch et al. 2006).

7.1.3 Development of heavy drinking determining midlife disadvantage

We found five different trajectories of heavy drinking from adolescence to midlife and they mostly resembled those found in previous studies with shorter follow-up times (Hill et al. 2000; Jackson, Sher, and Schulenberg 2008; Maggs and Schulenberg 2005). One study that had an equally long follow-up time as in this study did not find a rapidly decreasing group, but firm comparisons cannot be made, since they did not examine heavy episodic drinking (Virtanen et al. 2015). It has been stated that those who experiment with heavy drinking 'naturally recover' through the transition to adulthood (Muthen and Muthen 2000). This study shows that many, especially men do not mature out of heavy drinking. Previous studies have usually examined either health or social consequences of alcohol, but not both simultaneously (Klingemann and Gmel 2001a). Accumulation of heavy drinking from adolescence to adulthood was associated with several disadvantages in midlife. Thus these findings suggest that long-term heavy drinking is associated with several dimensions of disadvantage.

We found that steady high trajectory group in women and increasing group in men were associated with poor self-perceived health and depression in midlife. Previous alcohol trajectory studies have found inconsistent results regarding health outcomes (Hicks, Iacono, and McGue 2010; Hill et al. 2000; Tucker, Orlando, and Ellickson 2003). It might be that associations between alcohol use and health in early adulthood are blurred, when many still experiment with drinking, and the associations are not that clear in studies where follow-up ends in early adulthood compared to studies with longer follow-ups.

Regarding social relationships, we found women in the steady high trajectory group to have an increased risk for being separated, divorced or widowed in midlife. On the contrary we found the same risk in men who did not drink heavily in any of the follow-ups. This finding in men might reflect the important role alcohol use has in forming social relationships and meeting new people (Kuntsche et al. 2005; Seid, Hesse, and Bloomfield 2016). Unlike in most previous studies that have used non-heavy drinkers or steady low trajectories as a reference category (e.g. Hill et al. 2000), we used the moderate trajectory. The reason was to compare other groups to the most general behaviour. It might be that some associations regarding non-heavy drinkers have previously been missed.

Regarding socioeconomic outcomes, we found an association between the steady high trajectory group and unemployment in midlife in women, but not in men, which is in line with a study of Hicks et al. (2010), although they examined alcohol use disorders and only in men. Heavy drinking can cause low productivity and absenteeism and weaken the employment status. However, steady high and increasing heavy drinking were associated with having difficulties covering expenses with income in men. Hich et al. (2010) did not find this association in men, which again could indicate different life phases covered in the follow-ups. Heavily drinking adolescents enter the workforce usually rather early and at first earn more money than the group not drinking as heavily (Kouvonen and Lintonen 2002; Newcomb 1996), but in time this association with income and heavy drinking might disappear and then as the non-heavy drinkers enter the workforce after education, the association might become reversed.

In this study, moderate and decreasing trajectory groups did not differ substantially regarding midlife outcomes, which indicates that frequent heavy drinking in adolescence does not seem to be associated with midlife disadvantage if the drinking is reduced after adolescence. In this sense, adolescence does not seem to act as a critical period for subsequent disadvantages, although this study did not specifically examine this. However, it has been suggested that adolescence is a critical period of vulnerability for addiction via biological and structural development of the brain (Crews, He, and Hodge 2007). We also found that almost a fifth of men increased their drinking rather late in life and this was associated with various forms of disadvantage in midlife. This indicates that in addition to adolescent heavy drinkers, this is a group that should raise concerns, with more research needed to better identify this group. For example, it has been stated that early substance use is more influenced by family factors, while genetic factors become more significant with age (Kendler et al. 2008) and this might be one aspect affecting drinking in this group.

7.1.4 Gender differences

We found several gender differences in the distribution and accumulation of disadvantage. The suggestion that women tend to react to adversities more internally (e.g. with psychological symptoms) and men more externally (e.g. alcohol use) has been under continuous discussion (Aneshensel, Rutter, and Lachenbruch 1991; Hill and Needham 2013). In this study, we confirmed the previous findings that women reported more mental health problems in all examined life phases and men drank more often heavily from early adulthood onwards, although with this data it is difficult to distinguish whether these differences reflect differences in reporting styles or actual differences in behaviour. However, men's causes of deaths were more often alcohol-related than were women's, which supports a gender difference in this division and not just in reporting styles.

However, we could not confirm that long-term accumulation of disadvantage would clearly act according to this division. For example, we found that heavy alcohol use shapes the pathway from poor adolescent family relationships to poor mental health in midlife in women. This pathway via heavy drinking was not found in men. In addition, the pathway was found to be shaped by early adult mental health in both genders. Furthermore, we found an association between poor adolescent family relationships and economic adversity was shaped by early adult depression in women only. Previous studies have suggested that girls are more vulnerable to poor family relationships as adolescents and boys as younger children (Nolen-Hoeksema 2004). Our results support this suggestion in a sense that we found several indirect paths from poor adolescent family relationships to midlife disadvantage for women and only one path for men.

Several biological, social, and cultural reasons have been suggested as explanations for gender differences in these different forms of disadvantage and its accumulation (Kuntsche et al. 2006; Mäkelä et al. 2006; Moen 2016; Rutter, Caspi, and Moffitt 2003). For example, it has been suggested that risk factors and consequences for alcohol use might differ between women and men. Heavy drinking might be more accepted in men,

although this could be changing with younger cohorts (Holmila and Raitasalo 2005). Our results highlight the importance of continuing the thorough examination of gender differences in the accumulation of disadvantage.

7.1.5 Overall discussion

For many decades, several theoretical approaches to disadvantage have emphasised the importance of viewing disadvantage as a multidimensional concept (e.g. Allardt and Uusitalo 1972; Rutter and Madge 1976; Townsend 1979). However, research has not adopted this view as keenly, perhaps because of the difficulties in measuring and analysing multidimensional disadvantage. This study shows that, despite the difficulties of the broad view of the concept, it is essential to develop more comprehensive measures of wellbeing and disadvantage. We found that all different dimensions of disadvantage (health, risky behaviour, social relations and socioeconomic factors) play a role in the accumulation of disadvantage. In the simplest form this could mean that when examining the association between two forms of disadvantage, other dimensions of disadvantage should be taken into account. Other steps would be to examine the accumulation of disadvantage via several disadvantages simultaneously, because rarely do the disadvantages act in isolation. We found evidence for multiple simultaneous pathways that can more precisely be described as a complex web of association acting through the life course. It is especially important to include measures of social relationships in addition to more traditional disadvantage measures of health and socioeconomic factors. Our results highlight the importance of applying the principle of linked lives in the life-course perspective.

Examining disadvantage in a life-course perspective can have two equally important functions. First it is important to examine wellbeing and disadvantage in the role of determining wellbeing in later life phases, but equally important is to examine the disadvantage and wellbeing of a certain age group (see also Karvonen 1998). For example, we found several examples of how adolescent disadvantage was associated with midlife disadvantage, but equally important is to acknowledge that there are adolescents with multiple disadvantages in life and efforts should be made to reduce these clusters of disadvantage, regardless of whether they will lead to subsequent disadvantage or not.

We found two-fold meanings for individual forms of disadvantage. On the other hand, some of the findings suggest that one form of disadvantage does not usually induce adversities but the most problematic results appear when multiple disadvantages appear simultaneously (e.g. substudy I); on the other hand, in some of our findings, despite examining several different forms of disadvantage, only the role of one form of disadvantage emerged (e.g. in substudy III in men). However, our results provide several examples of how the forms of disadvantage are interlocked. Poor adolescent social relationships in the family are associated with disadvantage in various dimensions of life, the same applies to cumulative heavy drinking. The multidimensional approach to disadvantage can be viewed as an allocation of resources; e.g. if energy is put into getting along with parents, there might not be enough resources to succeed in school work.

Some of our findings (for example regarding the decreasing alcohol trajectory) differed from previous studies (Maggs and Schulenberg 2005). Even though these differences could be explained by various reasons, it is likely that one important reason is the difference in the age phases covered by the follow-ups. Previous alcohol trajectory studies have mainly covered adolescence and early adulthood, but many transitions in life are still in many ways in progress in early adulthood and the picture of longitudinal associations can appear rather different when the follow-up is extended to midlife. Another reason could be the use of different measures (alcohol use, heavy drinking, alcohol disorder) in previous studies.

When examining the accumulation of disadvantage, the role of these forms of disadvantage can be viewed from a variety of perspectives. In this study, forms of disadvantage were examined as clustered risk factors (Substudy I), as part of chains of risks (Substudies II-III), and as trajectories or outcomes of them (Substudy IV). We found evidence for all these different models, although addressing somewhat different study questions. It is also possible that these different models act simultaneously. For example, if the chain-of-risk model and cumulative model act simultaneously, it could mean that one form of disadvantage is a risk factor for a maladaptive trajectory of this disadvantage in question and simultaneously it can be a risk for other forms of disadvantage.

In our study of temporal accumulation of disadvantage (Substudies II-IV), we found little evidence for direct associations between adolescent disadvantage (poor family relations or heavy drinking) and midlife disadvantage, after early adult disadvantage was taken into account. Mostly the adolescent disadvantage was associated with midlife disadvantage via early adulthood adversities. Childhood and adolescent conditions are important and set the course, but do not set one's destiny. This emphasises the importance of examining indirect pathways and not just direct associations. Although adolescent disadvantage does not always have direct long-term effects on midlife wellbeing, it might leave the individual more vulnerable to subsequent disadvantages. In addition, if a person faces disadvantage already very early in life it becomes more difficult for the person to fully develop their potential (Schoon 2006).

Disadvantage often includes an assumption of deviation from normality, which can increase stigma and social exclusion (Helne 2002). Disadvantage can be defined as a state or circumstance in which certain individuals or groups find themselves. This might link people who have been defined as disadvantaged to a passive role, which however might be inaccurate or only temporary. In fact disadvantage has often been explained through cultural aspects of poverty or marginalization and seen as a way of life for certain groups (Lewis 1961; Waxman 1983). Pohjola (1994) contemplates what kind of terminology to use for study subjects when most of the concepts have a stigmatizing tone. The researcher should avoid casting stigmas, but on the other hand, somehow problems in wellbeing should be named in order to discuss and study them (Pösö 2002). The research approach that has been utilised in this study does enable a comprehensive examination of adversities in a person's life, but it should be acknowledged that a truly comprehensive approach would give equal attention to individual's resources.

7.2 Methodological considerations

This study was based on a single age cohort of people in one Finnish city, who were prospectively followed-up for 26 years. The main strengths of the study are the long follow-up time covering several different life phases from adolescence to midlife. Another important strength was the possibility to measure disadvantage from various approaches in all these life phases. However, the attrition and validity of the measures raises some methodological issues to consider when interpreting the results.

The prevalence of disadvantage should be interpreted while keeping in mind that who is disadvantaged is a matter of measurement. Different definitions of disadvantage produce different prevalences, which should be taken into account in the utilisation of this information. In addition, a person's own perspective could differ from our definition of disadvantage. It has been stated that the perception of life trajectories influences subsequent trajectories, which means that subjective views of positions and resources may play a more important role in shaping subsequent pathways than the actual position and resources (Ferraro and Shippee 2009). However, there are indications that objectively measured disadvantage is reported similarly to perceived disadvantage (Kainulainen and Saari 2013).

The greatest strength of life-course research might be the possibility to pay attention to diversity and heterogeneity, but those may also be the greatest challenges (Hutchison 2015). For example, one cause usually accounts for only a small proportion of the variance, since there are often so many other causes (Rutter, 1988). The complexity of these processes of accumulation of disadvantage underlines the caution of not making false conclusions about the causal relationships. For example, it might be that some genetic or personal characteristics influence both family relationships and the mental health of a person. Tracing these circular causal processes would require data that can take into account both the genetic and environmental aspects already in early childhood.

7.2.1 Non-participation

It has been suggested that the most disadvantaged are overrepresented in the non-participant groups especially in data collected with surveys (Hindmarch et al. 2015; Nicholson et al. 2011; Niemelä and Saari 2013). There might be many reasons for dropping out of the study and mortality explained only a small part of the non-response. In this study the participation rate at baseline was extremely high, covering almost the whole study population. However, there is attrition in the follow-ups. The rates of non-participation increased from 25% at age 22 to 39% at age 42. However, only 12% of the participants did not participate in any of the follow-ups after the school survey at age 16, and 1001 participants took part in all three follow-ups. The participation rates were higher in women than in men, which is a common finding in survey studies.

Non-participation was not associated with disadvantage in social relationships, health, or parental SEP at age 16. However, it was associated with poorer school grades at age 16. This could have affected the results. However, it is probable that the findings of this study

are more likely underestimating than overestimating the proportion of disadvantaged people, especially regarding low education.

Substudy I focused on adolescent disadvantage, while the follow-up was conducted with registers (mortality), thus there is very little attrition concerning these results. In substudies II-IV the study population was restricted to those who participated at age 42 and the FIML estimation method was used to deal with missing values due to attrition at ages 22 and 32 (substudy IV).

7.2.2 Methodological considerations of the methods used

Since in life-course research the focus is on interconnectedness between different life phases, the long follow-up times are a necessity. This study followed participants prospectively, which minimises the problems of memory and distortion. Many studies have collected data on just two or three time points, which does not enable an examination of continuous lifelong pathways (Pollitt et al., 2005). This study had several measurement points, although the time between the last three follow-ups was rather long (10 years). However, the data were collected in important life phases regarding the transition from adolescence to adulthood and unlike in many life-course studies, it also covered life phases beyond early adulthood.

The participants lived in one Finnish city in adolescence. Regional differences in adolescent disadvantage have been found previously (Karvonen and Kauppinen 2008) and therefore the results are not entirely generalisable to the whole population. However, results can likely be generalised to Finnish urban adolescents of that period. When studying the changes in a single cohort over time, effects that might be associated with ageing are confounded with period effects. Distinguishing these two kinds of effects is not easy. In this study, it was possible to examine only one age cohort instead of several, which might obscure age changes with cohort specific differences (e.g. Schoon 2006). It is likely that disadvantage manifests somewhat differently in present-day adolescents than with the participants of this study. For example, psychological symptoms are now more common in adolescents than in the 1980s, especially in socioeconomically disadvantaged groups, although there has not been as significant a change in the self-perceived health (Rimpelä 2005; Torikka et al. 2014). Regarding risky behaviour, especially adolescents' smoking has decreased. In weekly alcohol use, there have not been significant changes, although the proportion of adolescents abstaining from drinking has increased (Raunio et al. 2009). It is also important to acknowledge that the interventions and services that tackle the disadvantages have improved, although also several cuts have been made to the budgets of different service sectors.

These cohort and area differences might also increase cultural variation in the perception of what is disadvantage. In some analyses, we used dichotomized measures to divide participants into those who were disadvantaged and those who were not (mainly in substudies I and IV). These cut offs were often based on attempts to separate the most disadvantaged (e.g. 25% of the population), but sometimes also other criteria were used (e.g. in marital status). This choice led sometimes to very crude measures of disadvantage.

Another issue related to the disadvantages is that, when they were used to form a single risk index (Substudy I), all the factors were given an equal weight. In studies on multidimensional disadvantage, the weighting of different disadvantages is not a common practice and it has also raised some concerns (Schoon 2006). Further it should be acknowledged that the clustering of different forms of disadvantage were made based on the content of the disadvantages and no clustering technique was used.

All the measures (except mortality) were self-reported and thus are prone to general problems of self-reporting. Although some of the variables were standardised and used in several previous studies (e.g. K10), some variables were developed for this study (e.g. family relationships). In addition, some of the measures have kept their original form through the follow-ups (e.g. psychosomatic symptoms), but in some cases (e.g. heavy drinking) the measurement has been changed to better fit the current age phase or because of utilising a more detailed measure.

7.3 Implications for future research

Examining the accumulation of disadvantage from a life-course perspective brings many challenges for future research. More detailed information is needed especially on the magnitude, onset, timing, and duration of exposures to advantage and disadvantage (see e.g. Ferraro and Shippee 2009; Schoon 2006).

This study focused mainly on the negative aspects of wellbeing, but it is well known that several protective factors can buffer against or even change the direction of disadvantaged pathway. Thus, examining risk and protective factors simultaneously is more beneficial than focusing on just one aspect. The difficulty in disadvantage studies is also that for some, the risk exposure may have detrimental effects, while for others it may not have a significant impact. Thus, future studies should aim at targeting the vulnerable groups in more detail. In addition to examining those life paths that begin with adverse conditions and which later increase wellbeing, it would be important to examine the pathways that despite a rather balanced beginning lead to an adverse life path. For example, we found a group of men who started risky behaviour rather late in life and this was associated with several disadvantages in midlife.

As forms of disadvantage often work as a net of associations, establishing causal relations is difficult. However, more efforts should be put into collecting data that enable more thorough analyses of causality. This means beginning collecting data at very early life stages, already in utero. In addition, the interest in studying intergenerational transmission of disadvantage has emerged strongly, but despite some studies on this issue, more good quality data are still required to examine this issue from a multidimensional approach and also data to try to disentangle genetic and environmental effects (e.g. twin data).

Even though this study approached disadvantage from a life-course perspective, it did not in any ways utilise all the aspects of this perspective. For example, broader societal aspects affecting individual pathways of disadvantage should be examined more in future studies. Development of models where individual, community and institutional relations

and positions are taken into account simultaneously can be very useful in understanding different levels at which this accumulation of disadvantage appears (e.g. ecological systems theory) (Bronfenbrenner 1977). For example, previous studies have suggested that supporting children from poor family environments in other growth environments e.g. in schools and hobbies, can prevent accumulation of disadvantage (Gilligan 2000).

Another aspect of life-course research that requires more attention in the future is agency. People do not passively float through these pathways of wellbeing and disadvantage, but actively take part in heading towards different goals. Future studies should aim to more thoroughly measure and examine what is the level of agency in these pathways of wellbeing and disadvantage in life.

Disadvantage can be seen as a relative and a subjective concept. Due to the global movement of peoples it would be important to examine how people from different cultural backgrounds and from societies with different levels of wellbeing view dimensions of disadvantage. Another interesting question is to examine what kind of life paths are possible for ethnic minorities and immigrant groups that have lived in sometimes very different conditions at different life phases.

7.4 Policy implications

Accumulation of disadvantage is in many ways an issue of unequal distribution of wellbeing. Disadvantage and accumulation of it prevent the social sustainability of a society and the prevention of disadvantage should be the core focus of political aims. In general, welfare state politics in Finland have aimed in the right direction, since the general wellbeing of the population has improved considerably over the past decades. However, the unequal distribution of wellbeing has continued to persist or even has increased for many forms of disadvantage (Talala et al. 2014; Tarkiainen et al. 2012; Vaarama et al. 2014). Thus, policies have failed to improve the wellbeing of the population equally. Targeted interventions are required to improve the wellbeing of the most disadvantaged groups so that they reach the same level of wellbeing of the general population. These targeted solutions require an understanding of the temporal processes of the accumulation of disadvantage. The most disadvantaged groups also benefit from universal interventions. Often the difficulty is in identifying and reaching the least advantaged (e.g. Wolff and De-Shalit 2007). Universal interventions are a way to reach the most disadvantaged, thus both universal and targeted approaches are needed to improve the wellbeing of the population.

Almost everyone will face some forms of disadvantage in their lives and they can be transitory. It is unrealistic to try to remove all disadvantages from people's life, but a socially sustainable society should be able to make sure that difficulties in one dimension of life do not cause difficulties in others. When planning targeted interventions, it would be important to have knowledge about maladaptive causal processes that require change. However, the causal processes are complex and multiple interrelations between different forms of disadvantages challenge our possibilities to develop and implement specific

interventions. On the positive side these complex longitudinal chains of disadvantage, including many transitions, offer several opportunities for intervention.

It seems that especially the existence of multiple forms of disadvantage is harmful, thus it is important to take into account many dimensions of life simultaneously when planning interventions. This requires comprehensive approaches to an individual's problems: one model does not fit all. A comprehensive approach is needed also at the policy level. Health in all policies is an example of a multidimensional approach to policy making (Ståhl et al. 2006). Its core idea is that the health sector alone cannot solve complex health problems, which are often connected with other disadvantages. Thus promoting population health requires actions that involve all sectors of government at all levels of decision making. This approach to policy making should be adopted in other sectors of politics as well. For example, if actions of promoting employment do not fully take into consideration the health status and abilities to work in the population, they likely have only a little impact on employment. The Ministry of Social Affairs and Health have launched a strategy *Socially sustainable Finland in 2020* (2011), which emphasises e.g. health and welfare in all policies, balancing the various areas of life, reducing differentials in welfare and health and a strong sense of social inclusion. Many themes that came up in this study have also been acknowledged at the policy level. For example, intersectoral co-operation has lately drawn a lot attention and decision-makers at several levels have started to promote this approach in policy making and in services (Botezat et al. 2015; Santalahti, Petrelius, and Lindberg 2015). However, large ships turn slowly and often this kind of co-operation is difficult to put into practice due to organisational, cultural, or legislative issues (Stenius et al. 2015). The co-operation does not happen just with good intentions, but it requires determined efforts to support the organisations in developing new strategies in co-operation with organisations from other related sectors.

It has been stated that second chances are often second best (Graham and Power 2004), implying that early prevention of disadvantage has often better chances of long-term positive change than in a situation where disadvantage has already accumulated and been prolonged. This approach guides us to invest as much effort as possible in the early years of life (e.g. Heckman 2008) and since life-course research has often found adult disadvantages to originate in childhood, early prevention of disadvantage is important. However, it has also been stated that, if the early investment in disadvantaged children is not continued with later investments, its effect at later age phases is reduced substantially (Cunha, Heckman, and Schennach 2010; Dannefer, Kelley-Moore, and Huang 2016). When planning policies to reduce disadvantage, it should also be acknowledged that disadvantage is not a permanent characteristic of a person. Disadvantage can be related to some transition or a specific life phase e.g. divorce or moving away from parental home. Thus, disadvantages can appear also after a relatively balanced childhood. It is often easier to deal with these disadvantages if the foundation of development has been built on a strong base (i.e. a person has protective factors that help to tackle the disadvantages). However, investing every possible effort into the child, adolescent and family services does not remove the demand for well-functioning services for adults. Sometimes researches emphasising the importance of the early years for future wellbeing forget that no matter what, adversities can appear also later in life.

Furthermore, it is important to take into account different life phases, their intertwining nature and cohort differences when planning education, social and health policies. Individual development does not always meet the strict age limits regarding school and services. It has been stated that the Finnish welfare policy has not been able to adapt to an extended transition from adolescence to adulthood and to the new demands of these more complex transitions (Suurpää 2009).

Social relationships have usually not been the focus of research on disadvantage, although loneliness has been identified as one form of disadvantage (Saari 2016; Sipiläinen 2015; Vaarama et al. 2014). This is perhaps because it has been viewed as such a private dimension of life that it is not possible to target policies to this dimension in order to reduce disadvantage. Considering the important role of social relationships in multidimensional disadvantage, it is crucial to include social relationships as an essential part of various forms of disadvantage. The effort to reduce loneliness and improve the quality of social relationships has traditionally been social works' field of work. But it should be put into action also in other governmental sectors. Reducing disadvantage in social relations can also be a way to strengthen the supportive factors of a person, which can further buffer against other forms of disadvantage. When disadvantages or risk factors are difficult to remove, it is best to build up intervention strategies based on strengthening psychosocial resources. In addition to preventing severe family adversities such as poverty, there should be support for these families to achieve good quality relationships even in the presence of these adversities.

In contrast to social relationships, especially adolescents' risky behaviour has traditionally been under rather strict legal control in Finland. Considering that alcohol use is highly associated with the extreme end–point of accumulation of disadvantage (mortality), it is important to continue to constrain alcohol use through political means as well as in social and cultural contexts (Mackenbach et al. 2008; Viner et al. 2012).

The main focus and concern at the governmental level has been those disadvantaged that are not productive (i.e. not being in the labour market or actively aiming towards it). School dropout has probably been one of the top forms of disadvantage that has been the target of prevention efforts (Hall et al. 2015). The barriers to participating in education or the labour market are often a combination of structural (e.g. employment level) and individual (e.g. mental health problems) issues. This again underlines the importance of taking into account health and behavioural aspects when aiming towards higher employment rates. The benefits of this multidimensional approach can also be looked at the other way around. For example, in the USA, educational attainment has grown in importance as a means for reducing mortality in the last half of the twentieth century (Hayward, Hummer, and Sasson 2015).

Every individual has a possibility to influence their own wellbeing, but wellbeing and disadvantage are mainly formed in larger environments, in communities and in institutions. Thus prevention of disadvantage is primarily the responsibility of these larger societal structures. Policies should not tie people to one specific life path. Change for the better should be possible in all life phases and in any situation. This requires more efforts to develop systems that can more specifically take into account individual needs and variation in them (e.g. Wolff and De-Shalit 2007).

8 Conclusions

This study examined the accumulation of disadvantage from adolescence to midlife in a Finnish cohort of adolescents. Disadvantage was studied from a multidimensional perspective covering dimensions of health, socioeconomic factors, risky behaviour, and also social relations, which has not often been included as a dimension of disadvantage in empirical research. According to this study, different forms of disadvantage work as interlocking temporal processes, where previous conditions ameliorate or exacerbate wellbeing or disadvantage in subsequent age phases.

This study showed that accumulation of various forms of disadvantage in adolescence is associated with mortality, thus a comprehensive approach to interventions is needed. Disadvantage in dimensions of social relations was the strongest risk for mortality. This study also showed that family relationships in adolescence have a role in longitudinal chains of disadvantage, which underlines the importance of including social relationships as an important target for interventions for the prevention of accumulation of disadvantage. Further, by examining the effects of heavy drinking trajectories on midlife disadvantage, this study showed that multiple exposures to the same risk factors is a pronounced risk for various forms of disadvantage.

The results of this study highlight adolescence as an important life phase, which predicts midlife wellbeing, although wellbeing/disadvantage in early adulthood shapes the effects on the outcomes. While childhood and adolescence conditions set the course for subsequent wellbeing, these conditions are probabilistic rather than deterministic in nature. These findings can be utilised in several levels and sectors and in different social, health and education policies. Policies aimed at reducing disadvantage should be planned with a comprehensive rather than a too specific scope.

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Appendix

Appendix Table 1 Distribution of disadvantages and other life circumstances by gender

	Women		Men		Total			
	%	(n)	%	(n)	%	(n)	p[a]	% missing
14y (N=1334)								
Single-parent family	17.5	(124)	13.8	(79)	15.9	(203)	0.068	4.0
Reconstituted family	8.8	(62)	8.9	(51)	8.8	(113)	0.934	4.0
16y (N=2194)								
Health								
Poor self-rated health	12.2	(130)	12.3	(135)	12.3	(265)	0.988	1.4
Chronic illness	39.1	(419)	32.9	(369)	35.9	(788)	0.002	0.0
Psychological symptoms	26.4	(283)	17.9	(200)	22.1	(483)	<0.001	0.2
Somatic symptoms	27.5	(295)	19.7	(220)	23.5	(515)	<0.001	0.2
Depressive symptoms*	32.6	(239)	21.3	(127)	27.5	(366)	<0.001	0.2
Social relations								
Parental divorce	25.5	(271)	22.6	(251)	24.0	(522)	0.111	1.0
Parental death	5.9	(63)	5.9	(66)	5.9	(126)	0.999	0.4
Not close with father	25.0	(260)	15.6	(169)	20.2	(428)	<0.001	3.6
Not close with mother	9.8	(105)	10.5	(115)	10.2	(220)	0.621	1.5
Poor relationship with mother*	6.3	(2.7)	6.0	(2.5)	6.2	(2.6)	0.065	1.0
Poor relationship with father*	6.6	(2.7)	6.0	(2.5)	6.3	(2.6)	<0.001)	2.9
Nobody to confide in	6.9	(73)	23.7	(255)	15.3	(328)	<0.001	2.4
Poor home atmosphere*	2.0	(1.1)	1.8	(1.0)	1.9	(1.0)	0.001	0.9
Lack of parental support in individuation*	13.0	(4.8)	13.4	(4.3)	13.1	(4.6)	0.105	0.4
Lack of social support*	6.7	(49)	23.6	(137)	14.2	(186)	<0.001	1.5

Appendix Table 1 continued

Socioeconomic factors								
Poor school achievement	19.6	(208)	38.4	(426)	29.2	(634)	<0.001	1.1
Lack of educational plans	5.9	(63)	5.9	(53)	5.6	(122)	0.520	0.3
Low parental SEP (version 1)¤	50.5	(531)	49.7	(543)	50.1	(1074)	0.712	2.3
Parental SEP (version 2)*¤¤								
Upper non-manual	17.9	(130)	22.1	(131)	19.7	(261)	0.147	0.9
Lower non-manual	32.7	(238)	30.0	(178)	31.5	(416)		
Manual	49.5	(360)	48.0	(285)	48.8	(645)		
Parental unemployment	6.6	(71)	5.2	(58)	5.9	(129)	0.146	0.3
Risky behaviour								
Frequent alcohol use	5.2	(55)	9.6	(107)	7.4	(162)	<0.001	0.5
Heavy drinking								
Frequent	21.9	(161)	25.4	(152)	23.5	(313)	0.294	0.1
Infrequent	28.6	(210)	26.3	(157)	27.6	(367)		
No	49.5	(363)	48.3	(289)	48.9	(652)		
Daily smoking	19.4	(207)	25.1	(281)	22.3	(488)	0.001	0.3
Law breaking	2.2	(24)	8.8	(98)	5.6	(122)	<0.001	0.5
22y (N=1334)								
Health								
Somatic symptoms	4.8	(3.2)	3.2	(3.1)	4.2	(3.2)	<0.001	14.0
Psychological symptoms	3.7	(2.2)	2.6	(2.1)	3.2	(2.3)	<0.001	14.0
Depression	1.8	(3.1)	1.2	(2.6)	1.6	(2.9)	<0.001	13.8
Social relations								
Not in a relationship	29.6	(196)	40.4	(199)	34.2	(395)	<0.001	13.4
Socioeconomic factors								
Low education	41.8	(277)	52.6	(259)	46.4	(536)	<0.001	13.4
Basic education only (no vocational educ.)	13.7	(91)	10.4	(51)	12.3	(142)	0.086	13.4

Appendix Table 1 continued

Risky behaviour								
Frequent heavy drinking (version 1)**	2.2	(1.6)	3.1	(1.8)	2.6	(1.8)	<0.001	13.6
Heavy drinking (version 2)***								
Frequent	14.2	(94)	34.4	(169)	22.8	(263)	<0.001	13.7
Infrequent	48.2	(318)	47.0	(231)	47.7	(549)		
No	37.8	(248)	18.5	(91)	29.5	(339)		
32y (N=1334)								
Health								
Somatic symptoms	5.7	(3.7)	4.5	(3.6)	5.2	(3.7)	0.001	15.9
Psychological symptoms	4.2	(2.3)	3.2	(2.2)	3.8	(2.3)	<0.001	15.9
Depression	2.1	(3.1)	1.5	(2.7)	1.8	(2.9)	<0.001	15.9
Social relations								
Single, divorced, widowed	24.2	(156)	28.1	(133)	25.9	(289)	0.142	16.3
Socioeconomic factors								
Education								
Lower secondary	6.9	(44)	10.1	(48)	8.3	(92)	<0.001	16.4
Upper secondary	29.2	(187)	39.6	(188)	33.6	(375)		
Short-cycle tertiary	41.7	(267)	23.8	(113)	34.1	(380)		
Bachelor/master/doctoral	22.2	(142)	26.5	(126)	24.0	(268)		
Unemployment	10.9	(68)	6.8	(31)	9.2	(99)	0.022	19.0
Risky behaviour								
Frequent heavy drinking (version 1)**	4.3	(3.9)	7.7	(5.8)	5.7	(5.1)	<0.001	15.9
Heavy drinking (version 2)***								
Frequent	17.2	(111)	47.6	(226)	30.1	(337)	<0.001	16.0
Infrequent	48.5	(313)	39.8	(189)	44.8	(502)		
No	34.3	(221)	12.6	(60)	25.1	(281)		

Appendix Table 1 continued

42y (N=1334)								
Health								
Poor self-rated health	21.9	(160)	27.7	(166)	24.5	(326)	0.015	0.4
Depression	17.9	(131)	12.7	(76)	15.6	(207)	0.009	0.4
Psychological distress (K-10)	14.4	(4.3)	13.6	(4.8)	14.0	(4.6)	0.003	0.4
Social relations								
Single, divorced, widowed	25.7	(189)	20.8	(125)	23.5	(314)	0.035	0.0
Loneliness	25.1	(184)	30.2	(180)	27.4	(364)	0.040	0.3
Socioeconomic factors								
Unemployment	8.2	(60)	10.8	(65)	9.4	(125)	0.097	0.0
Low income	1532.5	(645.4)	1642.9	(706.5)	1582.3	(675.6)	0.003	2.1
Inability to cover expenses (version 1)+	3.1	(1.2)	2.9	(1.2)	3.0	(1.2)	0.015	0.1
Inability to cover expenses (version 2)++	32.6	(239)	28.4	(170)	30.7	(409)	0.100	0.2
Poor subsistence	2.5	(1.0)	2.4	(0.9)	2.5	(1.0)	0.096	0.2
Home ownership status renter or other	17.3	(127)	16.1	(96)	16.7	(223)	0.544	0.1
Risky behaviour								
Heavy drinking (version 2)***								
Frequent	18.5	(134)	45.6	(272)	30.7	(406)	<0.001	1.0
Infrequent	41.0	(297)	40.7	(243)	40.9	(540)		
No	40.5	(291)	13.7	(81)	28.4	(372)		
Mortality								
Deaths (n=2194)	1.2	(13)	3.1	(35)	2.2	(48)	0.002	0.5
Age at death (n=48)	34.4	(6.4)	30.3	(7.6)	31.3	(7.4)	0.121	0.0
Substance use related death (n=48)	30.8	(4)	65.6	(21)	55.6	(25)	0.033	6.25

a p for gender difference
*N=1334
¤ Parental SEP dichotomized (manual vs. other); ¤¤ Parental SEP 3 classes
** Frequency of drinking, frequency of heavy episodic drinking, harms related to alcohol use
*** Frequency of heavy episodic drinking
+ Variable measured on a 6-point scale; ++ Dichotomous variable (easy vs. difficult to cover expenses with income)

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